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AIR POLLUTION ABSTRACTS

29811-30585

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16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 29811 - 30585.

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VOLUME 4, NO. 10 OCTOBER 1973

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Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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APTIC Publications

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography With Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

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Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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FIBERGLASS FILTERS.
Arthur D. Little, Inc., Acorn Park, Cambridge, Massachusetts 02140

Contract No. 68-02-0294, Modification No. 4 .... *$85,177*
ANALYTICAL AND SAMPLING SERVICES.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1305, RFP No. Du-73-A601 .... *$42,052*
MOBILE LIDAR STUDY OF THE LOS ANGELES MIXING LAYER.
System Innovation and Development Company, Suite 202, Peninsula Prof. Arts Building, 707
Silver Spur Road, Rolling Hills Estates, California 90274

Contract No. 68-02-1540, RFP No. Du-73-C960 .... *$45,333*
FURNISH INTERRUPTIBLE INDUSTRIAL GAS SERVICE.
Public Service Company of N. C., Inc., 400 Cox Road, Gastonia, North Carolina 28052

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1973

29811 **APTIC NO. 51776**

HONDA S CLEAN ENGINE. *Autocar, 138(4005):24-25, March 1, 1973.*

Honda s unusual version of stratified-charge engine claims to solve air pollution problems to meet the American exhaust emission regulations for 1975. Although the power output is currently not as high as conventional engines, the fuel consumption should be very much better, and that represents a significant advance over other low-emission units. Honda has adopted the compound vortex controlled combustion (CVCC) principal. The CVCC system has many advantages over other low-emission engines. The engine will be able to run on loaded or unloaded gasoline. The fuel consumption is good and it compensates for the inferior performance, which may be improved as time progresses. If the engine requires no hang-on emission equipment, it could be cheaper to produce than other low emission engines.

29812 **APTIC NO. 51806**

Westinghouse Electric Corp.

THE GAS TURBINE GENERATING PLANT AND ITS CHANGING ENVIRONMENT. *Combustion, 44(10):15-19, April 1973.*

Gas turbine power plants are compact, permit underground fuel storage, and, because they require no water for their operation, do not contribute to the thermal pollution of water. Proposed emission regulations govern nitrogen oxides, sulfur oxides, particulates, and smoke; unfortunately, the techniques available for measuring these substances are often cumbersome and variable. Among the fuels available for gas turbine use are: jet fuel; diesel fuel; low contaminant, heavy fuel; and high contaminant, heavy fuel. The high contaminant, heavy fuel oil contains corrosive vanadium and sodium, a problem which can be overcome by manganese addition and washing. Techniques for desulfurization also remove vanadium and sodium, and trace metals. On the west coast, it is important that power plants be designed to withstand at least moderate earthquakes. Plants must also effectively protect the environment from noise that is harmful to workers and annoying to neighbors. Materials that absorb sound energy or prevent its passage are effective for high frequency noise, but less so for noise of low frequency. The appearance of the plant may be made more pleasing through the use of suitably painted or decorated structures. Gas turbine generating plants available from the Westinghouse Electric Corporation are being made with environmental restrictions in mind.

29813 **APTIC NO. 51820**

RANKINE CYCLE ENGINES VIE FOR A PLACE IN TOMORROW S CARS. *Prod. Eng., 44(3):16-18, March 1973.*

Rankine cycle engines are described to meet the deadline for emission standards. For a Rankine cycle engine, a thermal electron is working with an organic compound, trifluoroethynol and water. This composition was selected because of its low freezing point, -82 F and because it is thermally stable and will endure boiler temperature to 600 F. This organic fluid is vaporized in a combustion chamber and then expanded through the engine to provide power. The design goal for the engine is a unit that will match the cruising and acceleration characteristics of 351 cu in. Ford V-8 with automatic transmission. Fuel consumption is projected at 11.3 mi/gal under city and suburban conditions. A steam car designed by Pritchard Steam Power Pty., Ltd. of Australia is discussed. The Pritchard steam engine uses water and thus may have some problems in cold climates. The steam car has advantage of its low production of exhaust emissions.

29814 **APTIC NO. 51890**

Japan Environmental Agency, Bureau of Air Quality

A REPORT OF THE RESULTS OF AN INVESTIGATION ON FACILITIES IN REGARD TO THE ESTABLISHMENT OF EXHAUST STANDARDS. *(Haishutsukijun-to settei ni kakawaru shisetsu no chosakekka.) Text in Japanese. 29p., March 1973.*

Soot and smoke were measured in unregulated industries. For example, in Osaka there are 2300 unregulated iron works, 2700 metal products plants, 700 chemical plants, 110 cement manufacturers, 400 paper processors, and 1200 wood and rubber product makers. In these industries, dust is collected by cyclones, bag filters, and other types of equipment.

29815 **APTIC NO. 52166**

NATURAL GAS USED AS A FUEL IN ROOF HEATING PLANTS. *(Fluessiggas in Dachheizzentralen.) Text in German. Sanit. Heizungstech., 38(3):264-271, March 1973.*

The use of natural gas heating equipment in a high-rise apartment house complex in Stuttgart Lauchhau (West Germany) is described. Each apartment house has its own heating equipment on its roof, which is designed for natural gas firing and optional firing of light fuel oil during periods of gas shortages or peak consumption. The use of individual roof-mounted natural gas heating equipment has the advantages of minute heat loss and absence of smoke and soot emissions.

29816 **APTIC NO. 52271**

THE EMISSION OF SULFUR COMPOUNDS IN THE FEDERAL REPUBLIC OF GERMANY RISING TREND. *(Die Emission von Schwefelverbindungen in der Bundesrepublik Deutschland Tendenz steigend.) Text in German. Umwelt (Duesseldorf), 3(2):24-26, 1973.*

The world energy demand rises continuously, it will climb to four times thy present demand by the turn of the century. The largest part of the oxides of sulfur emitted comes from the combustion of sulfur containing fuels. The sulfur emissions by combustion processes can be calculated from the quantity of fuel used for combustion, its sulfur concentration, and the capacity of the fuel to bind sulfur. A survey of the increasing sulfur oxides emission by combustion processes in the period from 1960 to 1970 is given in a table. According to the table, the sulfur emission increased during this time by 21% from 1.40 million tons to 1.69 million tons. The emission by solid fuels dropped from 82% to 58%, while the emission from the combustion of fuel oils rose from 14 to 37%. In 1970 the industries emitted a total of 1.37 million tons of sulfur or 76%, domestic heaters 0.37 million tons or 20%, and traffic 0.06 million tons or 4%. Domestic heaters and traffic considerably reduced the sulfur emission.

29817 **APTIC NO. 52489**

SOURCES OF POLLUTION IN THE IRON AND STEEL INDUSTRY. *(Les sources de pollution dans l industrie siderurgique). Text in French. Metallurgie, 105(3):57-67, March 1973.*

The principal sources of dust, smoke, and gaseous pollution in the iron and steel industry are the mineral preparation installation (crushing, drying, sintering), the coking plant (stoking, distillation, extinction, side products), the blast furnace (mouth, gasification, slag removal, and pig iron casting), steel making (steel furnace, rolling mill, reheating furnace, accessory installations), and auxiliary installations like the foundry, boilers, and locomotives. The principal noxious effluents from coking plants are ammonia, waste water from the benzol plant, coke extinction water, and various tar and acid containing discharges where by-products are recovered. A blast furnace emits up to 4000 N cu m/t of coke, a gas containing 12% carbon dioxide, 28% carbon monoxide, 2.4% hydrogen, and 56.7% nitrogen. The preparation of alloys is a considerable source of pollution if practiced as is currently the case in open furnaces; in the future closed furnaces will have to be employed. The Thomas process emits iron oxide dust of a particle size rarely exceeding 25 to 30 micron. The Martin process emits iron oxides and sulfur oxides. Electrical furnaces emit large quantities of dust and of smoke, oxygen convertors emit predominantly dusts, rolling and finishing operations emit primarily liquid waste. A departure from past practice of bunching up industries has been occurring in recent times, plants are now being built frequently on the sea cost which has transport advantages and also minimizes pollution. The colder the climate in which a steel making plant is situated the less acute is the pollution problem it generates.

29818 **APTIC NO. 51797**

Arnold, G. D.

THE INCINERATION OF WASTE LIQUIDS, GASES AND FUMES. *Prod. Finishing, 26(4):21-27, April 1973. (Presented at the Pollution Control Conference, London, England, Nov. 1-3, 1972, Paper 18.)*

The chemical and petroleum industries have found that incineration can be a valuable tool in the disposal of a large variety of waste liquids and gases. Incineration has been adopted quite widely in the U. S. by the manufacturing industries as a means for controlling atmospheric pollution by fumes which are often large quantities of air discharged from processing ovens containing quite small amounts of hydrocarbons and solvents. Incineration provides effectiveness, flexibility, and a complete and final answer to problems of pollution by combustion matter. In incineration of any combustible material such as solids, liquids, or gases, the waste must be intimately mixed with enough oxygen to ensure complete combustion, and the whole of the mixture must be raised to a suitable temperature and maintained at this temperature long enough to allow the oxidation reactions to proceed to completion. Some examples of waste liquids, gases and fumes and typical incineration equipment are described. Heat recovery from incinerators and afterburners is discussed.

29819 **APTIC NO. 52000**

Biggers, S. B. and J. F. Wilson

DYNAMIC INTERACTIONS OF HIGH SPEED TRACKED AIR CUSHION VEHICLES WITH THEIR GUIDEWAYS. PART I OF A PARAMETRIC STUDY. *J. Dyn. Syst., Meas., Contr., 95(1):76-85, March 1973. 18 refs. (Presented at the American Institute of Aeronautics and Astronautics/American Society of Mechanical Engineers, Structures, Structural Dynamics and Materials Conference, 12th, Anaheim, Calif., April 19-21, 1971.)*

The vehicle-guideway system is modeled as an arbitrary number of lumped, doubly-sprung vehicle mass systems traveling in tandem along simple supported beans. The vehicle load is transmitted to the guideway as a time-varying uniform pressure compatible with vehicle motion. Effects of the dimensionless system parameters on vehicle heave acceleration, and guideway deflections and bending moments of high vehicle speeds are evaluated. Results for a vehicle which includes pitching motion compare favorably with those for a vehicle without pitch where the front and rear masses are uncoupled. By proper choice of parameters, passenger compartment heave accelerations can be minimized, although to keep this acceleration below 0.05 g for vehicles traveling 100-300 m/hr requires systems with low vehicle to beam mass and frequency ratios as well as low vehicle lower to upper mass ratios. The benefits of distributed air cushion pressure to vehicle and guideway design are shown. Also, if the ratio of lower to upper vehicle mass is low, a constant moving pressure conservatively predicts the guideway response. The air cushion vehicle is a rapid, economical, low pollution, comfortable means of transportation. (Author abstract modified)

29820 **APTIC NO. 52065**

Burkhart, V. R.

COAL IS STILL KING AT PP AND L - BUT FOR HOW LONG? Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 35p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-F-67.)

The general history of Pennsylvania Power and Light Company is described. At the present time the company is operating five coal-fired steam electric stations, two hydroelectric stations, and one steam heat plant which is being converted from anthracite to coal-fired. The company territory includes all of the anthracite producing region of Pennsylvania. It is only in recent years that bituminous coal has become a major fuel, as a result, of the decline of anthracite production and the fantastic electrical load growth which has dictated the development of the extremely large generating units, which have required enormous amounts of coal. Consumption, production, and cost estimations of anthracite and bituminous coal are tabulated. There is not enough low sulfur coal available to meet pollution control requirements. Low-sulfur coals cause electrostatic precipitators used to collect fly ash to be less efficient New, economic controls for sulfur dioxide and particulates are needed.

29821 **APTIC NO. 51811**

Chrusciel, Romuald

CAN AMMONIA INJECTION INTO THE FLUE GAS BE A SUCCESSFUL ENVIRONMENTAL PROTECTION METHOD? (Kann Ammoniak-Einduesung in das Rauchgas als Umweltschutzmassnahme erfolgreich sein)? Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 115(8):p. 19-23, June 1973. 27 refs.

The emission of alkaline air pollutants amounts to 6.7 billion tons/yr. The simultaneous emission the oxides of nitrogen and sulfur is estimated to amount to 420 and 336 million tons/yr. Sulfur dioxide in the atmosphere reacts after a while with alkaline air pollutants. The health protecting consequences of this neutralizing process have been pointed out. Based on this knowledge, a flue gas neutraliztion process with ammonia has been developed in Poland. Ammonium salt aerosols form some distance from the stack after dilution of the flue gas with large quantities of cold air. After a temperature drop below the crystallization point, ammonium sulfate particles form in the smoke plume with a grain size of less than 1 micron. The effect of the products of this neutralization on animals, vegetation, physical-chemical soil properties, water biology, and atmospheric corrosion were studied. Particularly the exposure tests with animals and plants revealed the protective effect of the ammonia neutralization. Based on the positive results of these tests, a scaled-down plant for the neutralization of the SO2 emissions from two power plant units with a combined capacity of 260 MW was built. The smoke plume did not differ before and after ammonia addition as far as the dust was concerned. About 20 kg NH3/hectare soil fell out during one month of uninterrupted neutralization. These positive results led to the construction of a full-size plant for a 2000 MW power plant.

29822 **APTIC NO. 51724**

Davis, Stephen R. and Naeim A. Henein

CONTROLLING EMISSIONS WITH THE STIRLING ENGINE. *Automotive Eng., 81(4):32-36, April 1973. 1 ref.*

A Stirling engine research model was studied to determine methods for decreasing engine exhausts. The engine design and operating variables are reviewed. Emissions in general decreased with increasing air-fuel ratios. Emissions of nitric oxide and carbon monoxide decreased with flow through the preheater. Nitric oxides were reduced even more by using exhaust gas recirculation.

29823 **APTIC NO. 52181**

Dudgeon, E. H.

GAS FLOW MODELING AS AN AID TO SMELTER DESIGN. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 20, 1973. 7 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-67.)*

Modeling studies of internal, incompressible gas flow inside ducting or vessels can be an important aid in pyrometallurgical smelter plant design or modification. The studies can be conducted with transparent plastic models that permit flow visualization with smoke streamers or wool tufts. Elaborate instrumentation is not required, the most common measurement being static or total pressure. Accurate flow measurements are provided by orifice plates, venturis, or pitot or hot wire anemometer traverses. The procedures and potentialities of the gas flow modeling technique are illustrated by reference to a smelter flue study, a converter breeching and flue study, and a copper reactor study. In addition to providing confirmation or modification data for plant design studies, gas flow modeling studies provide the data needed for accurate assessment of alternative flow control proposals, either for new systems or for systems requiring modification or improvement. Use of the technique is expected to increase as demands for improved control of gas emissions mount.

29824 **APTIC NO. 52452**

Ebersbach, K. F.

ENERGY RECOVERY BETWEEN IDEA AND REALITY. *(Energierueckgewinnung zwischen Idee und Realitaet). Text in German. Brennstoff- Waerme-Kraft, 25(7):295-298, July 1973.*

Heat recovery provides a method for limiting thermal pollution of the air and water and it helps ease the growing energy shortage. Waste heat can be recovered depending on the type of waste heat accumulation (concentrated or diffuse), on the temperature level, and on the time interval between waste heat production and heat demand. In most cases heat recovery is feasible by means of existing processes. Quite new is the idea of heat recovery in households. Several households have to be combined for this, because heat recovery in the individual household is hardly worthwhile. For any heat recovery, the quantity of waste heat that is available and the heat demand must first be determined. The results of such an analysis and the concept of waste heat utilization derived from it in the case of a brewery is discussed. A brewery with an annual beer production of 800,000 hectoliters consumes about 105 MWh/day of heat and produces 64.5 MWh/day of waste heat. Through recovery of the entire amount, 60% of the heat demand can be covered. A two-step process for heat recovery has been selected in this particular brewery. The heat from the cooler is used by direct heat exchange for heating water to 70 C. The waste heat from the bottle filling station and the refrigerator is used for producing warm water of 50 C with the aid of a heat pump. Through this the fuel consumption of the brewery can be reduced by about 35%, which brings cost savings of $4.00/MWh. The investment and other necessary costs for heat recovery amount to $4.50/MWh for the existing plant. They would be less for a new plant.

29825 **APTIC NO. 51882**

Fujii, Shoji

DIESEL ENGINES. *(Diizeru enjin). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(6):617-622, June 1973. 15 refs.*

In 1972, the demand for trucks in Japan increased by 12.8% for small trucks and 6.1% for ordinary trucks. New high-power diesel engines were introduced to meet the need for high-power, durable, and reliable engines. Various types of the new engines are described in diagrams. Operating variables and pollutant emissions are discussed.

29826 **APTIC NO. 52337**

Fukunishi, Toyoji

TECHNICAL DEVELOPMENTS OF TWO-CYCLE ENGINES AND THE SUZUKI EPIC SYSTEM. *(2-saikuru enjin no gijutsukaihatsu to Suzuki EPIC shisutemu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):44-49, Jan. 1973.*

Improvements in two-cycle engines include modified cylinder structure providing improved power output and engine revolution, improved intake, improved oil feed, and improved cooling. Two-cycle engines have identical combustion at full opening as four-cycle engines, provided the intake volume of the four-cycle engine is equal to the filling efficiency of a two-cycle engine. Intake pressure decreases with a smaller throttle valve opening with a four-cycle engine and remains at 1 atm regardless of throttle valve opening with a two-cycle engine when the scavenging valve is closed. The throttle valve opening only affects the new mixture/residual gas ratio with a two-cycle engine; more residual gas occurs with smaller throttle valve opening. This adversely affects combustion efficiency and causes the cylinder temperature to rise. A four-cycle engine has a flame velocity of 10-20 m/sec with an ignition delay of 6.0-1.5 m/sec; a two-cycle engine has 20-50 m/sec velocity with 0.5-0.2 m/sec ignition delay. A new low-pollution two-cycle engine has been developed which emits blowby gas through the exhaust port where it is ignited and afterburned after the exhaust port is closed. This reduces hydrocarbon and carbon monoxide emissions without the use of an ordinary afterburner.

29827 **APTIC NO. 51757**

Gasparovic, N. and D. Stapersma

GAS TURBINES WITH HEAT EXCHANGER AND WATER INJECTION INTO COMPRESSED AIR. *(Gasturbinen mit Waermeaustaucher und Wassereinspritzung in die verdichtete Luft). Text in German. Brennstoff-Waerme-Kraft, 25(6):232-239, June 1973. 13 refs.*

Water injection into the condensed air between a condenser and heat exchanger in gas turbines increases the efficiency slightly and the power of two-shaft systems up to 55%. Such gas turbines therefore become specifically cheaper than gas turbines without a heat exchanger. Regulation of the water supply is simple; it is coupled with the fuel supply. The injection of 6% water reduces the emission of the oxides of nitrogen to at least 1/2. Investment costs are low, and the operating costs are negligible. The specific fuel consumption changes only slightly.

29828 ***APTIC NO. 51825***

Hannes, K. and F.-W. Moellenkamp

THE IMPORTANCE OF REMOTE HEATING FOR THE PROTECTION OF THE ENVIRONMENT. (Die Bedeutung der Fernwaermetechnik fuer den Umweltschutz). Text in German. Brennstoff-Waerme-Kraft, 25(6): 224-229, June 1973. 21 refs.

Remote heating systems must be erected as close to the consumers as possible because of the cost factor concerning the heat distribution system. The specific costs of a heat unit reduce with increasing length of the heating season. Remote heating systems are therefore preferably used in the Scandinavian countries to an extent of 90%, as well as in Russia. In the Federal Republic of Germany, remote heating came into being 20 years ago. The city of Hamburg has a remote heat supply network of more than 180 km. Remote heating plants connected with power generation have the advantage that no waste heat is discharged into the environment. Incinerators can be combined with both power generation and remote heat supply. The Frankfurt incinerator with a maximum waste throughput of 1000 tons/day is equipped with two generators each for 15 MW. It is enormously difficult to plan such combined heat/power/incineration systems for optimum operation. This is also one of the reasons why remote heating, although extremely non-polluting as compared to individual heaters, did not spread more rapidly in West Germany. Conventional remote heating plants can be fired with coal, coke, heavy fuel oil, light fuel oil gas, or trash. In the future it will be also feasible to use nulcear power for remote heating, which will pollute the environment even less. Conventional remote heating plants have the advantage that the fly ash, carbon monoxide, hydrogen sulfide, ammonia, hydrocarbons, and oxides of nitrogen can be better controlled than in small individual home heaters. In the future it will also become possible to remove the sulfur compounds from the waste gases of remote heating plants.

29829 **APTIC NO. 52119**

Hino, Yoshinori

EMISSION FACTORS OF COMBUSTION POLLUTANTS. *(Hassei netsuryo atari nensho kogai buhitsu no haishutsu ryo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(4):50-59, April 1973. 2 refs.*

The amount of pollutants emitted from various types of furnaces using various fuels is calculated. The carbon monoxide emission factors are 0-0.72 g/1000 Mcal for natural gas, 0.48-2.4 for petroleum, 35-3460 for carbon, and 450-20,000 for garbage combustion. The emission factors for hydrocarbons are negligible for natural gas, 24-38.4 g/1000 Mcal for petroleum, 15-693 for coal, and 140-360 for garbage combustion. The emission factors for formaldehyde are 0-2.0 g/1000 Mcal for natural gas, 7.2-24 for petroleum, 0.35 for coal, and 140-450 for garbage combustion. The emission factors for particulate matter smaller than 5 micron in diameter are 27-33.2 for natural gas and 96-276 for petroleum. Particulates from petroleum combustion consist of 17-25% sulfate, 10-30% inorganic salts, and 25-50% carbon soot. Coal combustion particulates consist mostly of inorganic salts, especially silicates or aluminum oxides. The emission factors for sulfur oxides are 0.72 for natural gas, 1900 for petroleum, and 2630 g/1000 Mcal for coal. The emission factors for nitrogen oxides are 209-700 for natural gas, 144-1250 for petroleum, and 553-1480 for coal.

29830 **APTIC NO. 52154**

Hino, Yoshinori

THE AMOUNT OF POLLUTANT EMISSION BY COMBUSTION PER CALORIC QUANTITY. *(Hassei netsuryo atari nensho kogai busshitsu no haishutsuryo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(4):50-59, April 1973.*

The quantities of air pollutants produced by combustion are reviewed by the type of fuels and type of installations. Carbon monoxide is produced by coal combustion (35 g/1000 Mcal), but actual measurements are irregular, and the quantity increases for smaller furnaces. Urban waste produces 450 g/per ton of waste; industrial and commercial waste, 3540 g/ton when using a multiple chamber incinerator, and 20,000 g/ton when using a single chamber incinerator. Hydrocarbon emission is 15 g/1000 m cal with coal; 140 g/ton with urban waste, and 230-360 g/ton with industrial and commercial waste. Formaldehyde is emitted at 140 g/ton of urban waste, 90 g/ton of industrial and commercial waste by a multiple chamber incinerator, and 450 g/ton by a single chamber incinerator. Benz(a)pyrene is emitted 15 mg-1.6 g/1000 mcal by a medium to small incinerator. Particulates produced are 32.4 g/1000 Mcal by the industrial use of natural gas and 33.2 g/1000 Mcal by the domestic use of natural gas. When using fuel oil, 276-180 g/1000 Mcal of particulates are emitted from industries and 96 g/1000 mcal from domestic sources. Oil produces about 1900 g of sulfur dioxide per 1000 mcal; coal about 2630 g; and natural gas about 0.72 g/1000 Mcal. Nitrogen oxides are also discussed.

29831 **APTIC NO. 52485**

Hug, H. R. and H. Hauri

ELECTIC POWER FROM SEWER GAS. *(Elektrischer Strom aus Faulgasen). Text in German. Gesundheitstech., 7(6):115-116, 1973.*

In modern purification plants, the gas from the rotting process is no longer burned in a flare but used for heating and power generation. Switzerland has at present six purification plants with heat and power production from the rotting gas. These gases consist of 60 to 65% methane, the rest is carbon monoxide, carbon dioxide, and nitric oxide. They burn smokelessly. For the utilization of sewer gas, only the combustion engine can be used, not the gas turbine which requires a uniform supply of gas. If the supply of sewer gas ceases, the combustion engine can be switched without interruption to operation with diesel oil. A combined solid waste recycling and waste water purification plant in Switzerland is equipped with two five-cylinder engines for operation with sewer gas and diesel oil. It has a total capacity of 1150 hp. It produces 12,000 kWh/day during 15 hr and about 680,000 kcal/hr of heat from sewer gas which is supplied to the rotting chamber; part of it is used for heating the plant facilities.

29832 **APTIC NO. 52158**

Ihara, Seijiro

ENERGY AND ENVIRONMENT. *(Enerugi to kankyo). Text in Japanese. Seimitsu Kikai (J. Soc. Precision Mech. Japan), 39(3):272-279, March 1973. 19 refs.*

The main sources of energy in the future will be fossil fuels, nuclear energy, and water power. Fossil fuels will be one direct source of air pollution, which will produce solid particulates, carbon monoxide and dioxide, sulfur oxides, hydrocarbons, and nitrogen oxides as a result of combustion. The dispersion process and the form and degree of the effects of such air pollution are not yet known. But an approximate emission quantity has been calculated from an experimentally obtained emission index. The recent estimate of such emissions for the entire world are: 20 million tons of particulates, 900 million tons of COx, 80 million tons of SOx, 80 million tons of HC, and 50 million tons of NOx. The effects of air pollutants on the weather are often discussed, but no conclusion has been reached. While there is a theory that the earth s temperature is rising with the increase of CO2, there is another theory that suspended particulates are interrupting the solar radiation and the temperature is dropping. In reality, the earth s temperature has dropped about 0.3 C since 1940. The energy resources and energy cycles are discussed.

29833 **APTIC NO. 52200**

Jones, James R.

AIR POLLUTION FROM MINING OPERATIONS. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Society of Mining Engineers, 22p., 1973. 1 ref. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 102nd, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73F98.)*

The potential sources of emission discussed in this paper cover only the major problems facing the coal industry. The modern coal mining industry is aware of the many rules and regulations facing it with regard to the environment. All sources of potential air pollution emissions at existing, as well as new coal mine operations must undergo careful scrutiny. The most obvious and expensive control will be that of particulate emissions from thermal driers. These are capable of measurement of stack emission tests. Fugitive dust emissions from breakers, crushers, and other preparation plant facilities emitting dust will require water sprays or enclosures with some type of collector. Handling systems as well as loading facilities will require efforts to minimize fugitive dust. Haulage roads will require oiling and more frequent spraying with water to aily dust. This will be particularly true in areas visible from public roads and neighboring residences. (Author summary modified)

29834 **APTIC NO. 51966**

Kennedy, A. M., N. J. Peet, and V. M. M. Brown

FUEL SUPPLY, ENERGY DEMAND AND POLLUTANT EMISSIONS IN THE CHRISTCHURCH URBAN AREA. *New Zealand Eng., 28(2):33-41, Feb. 15, 1973. 31 refs.*

Data on fuel use, energy demand, and pollution emissions in Christchurch, New Zealand, were obtained to provide guidelines for implementing newly passed clean air legislation. Despite a marked drop in domestic coal sales since 1965-1966, domestic coal burning still makes the largest single contribution to sulfur dioxide emissions and is the most significant source of smoke. Control of air pollution will involve replacement of domestic coal and wood, plus thermal insulation to enable fuel and energy conservation. Complete replacement of wood and coal by electricity would require up to 140 mw of increased generating power. The capital cost of replacing the open fire by electrical appliances could total $4 million, averaging $100/household. Although this expenditure might be spread over a 5-10 yr period, the optimum control strategy might dictate partial substitution by other fuels or heating methods. Gas could be an acceptable alternative; large-scale introduction of domestic oil-heating or downdraft coal combustion heaters should also be considered. The unit cost to the householder of the last two alternatives would be greater than for electrical or gas heating, but the overall costs could be significantly lower. Allowance would have to be made for the higher costs of low-sulfur coals and the added costs of importing low-sulfur crude oils. Hydrocarbon, nitrogen oxide, and carbon monoxide emissions from transportation sources are not yet a significant factor in air pollution over Christchurch; however, their continued monitoring is justified. Light and heavy fuel oils are taking up a steadily increasing share of the industrial and commercial fuel and energy demand.

29835 **APTIC NO. 52197**

Kikuchi, Hidezo

BCX-II. (BCX-II ni tsuite). *Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):96-99, Jan. 1973.*

An electrically driven midget personal car carrying two men including the driver, the BCX-II developed by Daihatsu Kogyo, was designed for short-distance travels in city areas to alleviate air pollution and traffic jams. Available in two types, one the full canopy type and the other the open type, it weighs 450 kg. Powered by lead acid batteries, it runs 30 km per charging, the maximum speed being 20 km/hr. It uses a flange type DC series motor directly coupled to the differential, using no transmission mechanism. The motor control is a resistance controlled four-step system in which the resistors are switched over by the rotary type sliding contactor linked to the accelerator pedal. The body is a one-unit molded structure made of FRP (Fiber Glass Reinforced Plastic). Six units of 6V-130AH storage batteries are connected in series to obtain the 36 V operating voltage. The batteries weigh about 120 kg, accounting for about 26% of the total vehicle weight, the percentage being smaller than in an ordinary electric automobile.

29836 **APTIC NO. 52342**

Kobayashi, Akira

ROAD TO STEAM AUTOMOBILE. *(Jokijidosha eno michi). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):84-93, Jan. 1973.*

Piston engines, gas turbines, Stirling engines, fuel batteries, and steam engines are discussed. Steam automobiles date back to 1770; from 1897 to 1925 there were 80 steam automobile manufacturers in the U. S. Steam engines are a possible replacement for piston engines, since they may meet the strict emission limits of the Muskie Act. Several companies are developing steam buses and automobiles.

29837 **APTIC NO. 52347**

Koerbel, Wilhelm

TREATMENT AND COMBUSTION OF INDUSTRIAL AND CHEMICAL WASTE PRODUCTS DISCUSSED AS EXAMPLES OF EXISTING PLANTS. *(Behandlung und Verbrennung von Industrie- und Chemieabfaellen am Beispiel ausgefuehrter Anlagen). Text in German. Energie Tech., 25(6):148-153, 1973.*

Various types of incinerators for the disposal of industrial wastes are described. A rotary kiln for the incineration of 50% liquid and pasty wastes and 50% solid waste is illustrated and described. A total of six special burners have been designed to burn a maximum of 200 kg/hr liquid waste. In addition to this, 2000 kg/hr dirty water can be injected into the flue gas. The temperature of the waste gas is about 330 C. Flue gases are passed in dry state through an electrostatic precipitator and discharged through a 120 m high sheet steel stack. A steam boiler is connected with a capacity of about 14 tons/hr at a pressure of 25 atm and a steam temperature of 270 C. A second rotary kiln incinerates 2300 kg/hr solid and pasty refuse as well as 500 kg/hr liquid waste. The rotary drum has an inner diameter of 3000 mm and a length of about 12 m. Waste heat boilers are connected to the incinerator. Each one is designed for a steam capacity of 15,500 kg/hr at a vapor pressure of 19.5 atm; the steam temperature is 290 C. The flue gases are cooled to 300 C and cleaned in electrostatic precipitators to a residual dust concentration of 75 mg/cu m. A smaller rotary kiln for 1100 to 1200 kg/hr solid, pasty, and liquid waste is in discontinuous operation in a refinery for waste oil. It is connected with a waste heat boiler with two flues. The waste gases are cleaned by a mechanical dust collector. The amount of sulfur in the waste has not caused any difficulty in the five years the kiln has been in operation. Five more rotary kilns are illustrated and described. One of them deserves special mention because it burns waste products containing about 6% chlorine which requires special cleaning facilities for the waste gases. They comprise a venturi cooler and a scrubber. Sufficient scrubbing water is available which is returned to the harbor.

29838 **APTIC NO. 52038**

Konnik, E. I.

ELECTROCHEMICAL OXIDATION OF CARBON MONOXIDE IN AQUEOUS SOLUTIONS. *(Electrokhimicheskoye okisleniye okisi ugleroda v vodnykh rastvorakh). Text in Russian. Usp. Khim., 42(2):216-231, 1973. 32 refs.*

Studies on the electrochemical oxidation of carbon monoxide in acid and basic solutions with regard to its application to fuel cells are reviewed. Direct oxidation of CO is possible in aqueous solutions of sulfuric acid or perchloric acid, by using platinum or palladium electrodes. Electrochemical oxidation of CO is also possible in aqueous solutions of potassium hydroxide or potassium carbonate by means of nickel, copper, tungsten, palladium, molybdenum, platinum, rhenium, ruthenium, iridium, or osmium electrodes possessing satisfactory polarization characteristics. Studies are being conducted with electron donors and homogeneous catalysts in view to their application to the electrochemical oxidation of CO. Complex salts of palladium, platinum, ruthenium, rhenium, osmium, iridium, chromium, iron, copper, and tin are being considered for such purposes.

29839 **APTIC NO. 52285**

Kuwata, Masayoshi and Robert H. Essenhigh

INFLUENCE OF MIXING ON NO PRODUCTION FROM NATURAL GAS FLAMES. *Combustion Flame, 20(3):437-439, June 1973. 3 refs.*

Measurements of nitric oxide concentrations in the exhaust of a high intensity combustor burning natural gas are reported. The NO production was dominated by internal mixing in the combustor. The NO concentration and gas temperatures were measured in the exhaust nozzle as an average for the whole flame. These results have implications for both the fundamentals of combustion and for applications. At the fundamental level they focus attention both on the importance of the hot spots, or exothermic centers, and on the importance of the hot spots, or exothermic centers, and on the residence time distribution, with the latter as possibly a prime factor determining unburned loss. At the applied level, the results have implications for engine design with the possibility of approximately rationing the turbulent and convective mixing components to minimize the NO emissions. If the fuel and oxidant supplies are not premixed, a parallel argument would suggest that smoke emissions likewise would be minimized. Similarly, if very rapid combustion of the discrete volumes approaches explosive rapidity, then the results may also relate to control of combustion noise. (Author conclusions modified)

29840 **APTIC NO. 51745**

Learmonth, R. A.

AIR POLLUTION FROM POWER PLANTS IS A WORLD PROBLEM. *Heating and Ventilating Eng., 46(547):386-388, Feb. 1973.*

Air pollution originating in coal and oil-fired power plants has become an international problem. There are 11 countries which share over 80% of the world s fossil-fired generating capacity. Air pollution problems are associated with fuel characteristics, quantity of indigenous fuels, unfavorable topographic and meteorological conditions, concentrations of power plants in the limited area, population densities, and particular sensitivities to particular pollutants. From 1955 to 1966 the growth of generating capacity in the 11 countries increased at 7.9%/yr. Of the total thermal energy, 58% is generated from coal, 41% from oil, and 1% from gas. Particulates and sulfur dioxide pollutants given off by fossil fuel combustion are discussed. The U. S. produces about 39% of the world s thermal electric power and thus produces some 20 million tons of SO2 emissions/yr. Sulfur content of the most of the world s bituminous coal ranges between 1 and 4%. Ash content ranges from 5 to 20%. The costs to control pollution from fossil fuel power plants will be high. The capital cost to control fly ash to 99% on just new capacity during the next 8 years will be $500 million. For SO2 the investment to attain 50% control by 1975 will be 4.5 billion dollars. Various pollution control activities are discussed.

29841 **APTIC NO. 51781**

Limoni, Uri

ECOLOGICAL IMPLICATIONS OF THE MODULAR BOILER SYSTEM. *Bldg. Systems Design, 70(4):40-43, April/May 1973. 6 refs.*

A review and comparison of the performance of a modular system and a typical boiler room presently used for commercial and industrial applications are presented. Typical problems of a modern boiler room and the solution affected through use of a modular boiler system are discussed. The modular system helps reduce equipment and operating and maintenance costs. Emission characteristics are comparatively superior, and economical fuel consumption contributes to the reduction of pollutants. Installation of a modular system is simple. The modular system offers substantial reduction in the amount of air emissions, especially particulates and nitrogen oxides.

29842 **APTIC NO. 52427**

Mackay, Donald and Aaron W. Wolkoff

RATE OF EVAPORATION OF LOW-SOLUBILITY CONTAMINANTS FROM WATER BODIES TO ATMOSPHERE. *Environ. Sci. Technol., 7(7):611-614, July 1973. 17 refs.*

Equations were derived to predict the rate of evaporation from aqueous solutions of compounds such as hydrocarbons and chlorinated hydrocarbons which are of low solubility. The rate of evaporation can be high even for compounds of low vapor pressure, and half lives in solution can be as low as minutes or hours under laboratory or environmental conditions. The rate can be limited by diffusion or desorption. Transfer of contaminants from the water to air environments can thus occur faster than was generally believed. Evaporation parameters and rates were given for various compounds at 25 deg C, especially alkanes, aromatics, pesticides, and mercury. (Author abstract modified)

29843 **APTIC NO. 51783**

Mantle, E. C.

CONTROL OF EMISSIONS FROM THE NON-FERROUS METALS INDUSTRY. *Chem. Engr. (London), no. 272:203-207, April 1973.*

Althouth the United Kingdom s consumption of non-ferrous metals per capita is among the highest in the world, there is little primary refining of these in the United Kingdom. The secondary refining of non-ferrous metals is considerable, and the waste gases can be highly toxic and in many cases are highly corrosive. Studies have been made of emissions from secondary copper refining during the refining cycle in such a furnace which usually takes place over 24 hr. These figures indicate a loss of copper as fume equivalent to about 0.4 kg/ton of metal refined, and no special collection plant for the fume is required, dispersal being considered adequate. Analysis of particulate matter in the fume from secondary aluminum refining is also presented. Because of the toxicity of lead and its cumulative effects on man and animals, emissions from lead works are strictly regulated. The emission limits are based on the size of the works expressed in terms of the volume of the emission, rather than in terms of size of production. Future trends in controlling emissions from the non-ferrous metals industry are discussed.

29844 **APTIC NO. 51810**

Masek, Vaclav

THE PROPERTIES OF METALLURGICAL FLY DUSTS. *(Zu den Eigenschaften der huettenmaennischen Flugstaeube). Text in German. Gesundh. Ingr., 94(6):180-184, 1973.*

Fly dust samples were taken in the ambient air 1.5 m above the ground level on the premises of a metallurgical plant in the vicinity of the agglomerating station, the blast furnaces, the steel mill, and the rolling mill. The flow potential was measured with Shukow s apparatus. The velocity of hydrogen peroxide dissociation as well as, the sorption properties of the original dust and of dust introduced to the hydrogen ion cycle were examined. Moreover, ion exchange experiments and adsorption tests of gases and vapors were performed. The results of the ion exchange experiments were proportional the values of the electrical particle charges. They were entirely dependent on the adsorption properties of the dusts. As far as the sorption properties were concerned, the samples had amphoteric character. Due to aging and hydrolytic processes, the basoidal activity increased. The examined dust samples absorbed gases and vapors to a relatively low extent. The radioactivity of all samples was negligible.

29845 **APTIC NO. 52185**

Mostert, J. C. and P. N. Roberts

ELECTRIC SMELTING OF NI -CU CONCENTRATES CONTAINING PLATINUM GROUP METALS AT RUSTENBURG PLATINUM MINES LIMITED. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, 21p., 1973. 1 ref. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society 1973, Paper A73-48.)*

The processes involved in the electric smelting of nickel-copper concentrates containing platinum group metals are described. These are concentrate drying, pelletizing, pellet drying, flux and pellets proportioning followed by smelting of concentrate in a 19.5 MVA electric furnace with six in-line Soderberg electrodes operating in pairs in a three-phase electrical system. The furnace matte is blown in Pierce-Smith converters to the white metal stage and cast as such in moulds while the slag is granulated, ground, and floated for recovery of platinum group metals, nickel, and copper and afterward pumped to the slimes dam. Furnace and converter exhaust gases pass through electrostatic precipitators and up a 600 ft stack with an acid-resistant brick lining. Of the sulfur entering the smelter and converter operations, 60% leaves with the converter gases (2.5-6% sulfur dioxide), 20% with the furnace gases (0.4% SO2), 15% with converter matte, and 5% with the furnace slag. Future plans call for sulfuric acid production from converter gas SO2. Dust is removed from the flues through bottom outlet ports and, together with that recovered from the precipitators, is washed down and pumped to a thickener. The thickened pulp is filtered and added to flotation concentrates.

29846 **APTIC NO. 52467**

Nakao, Ryuichi

EXHAUST GAS CONTROL AND ROTARY ENGINE. *(Haikigasu kisei to rotari enjin). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):12-15, Jan. 1973.*

Compared with a reciprocating engine, a rotary engine gives the same carbon monoxide emissions governed by the air/fuel ratio, greater hydrocarbon emissions due to larger S/V (surface area to volume) ratio of the combustion chamber, and fewer nitrogen oxides emissions due to lower combustion temperature. The Mazda REAPS (Rotary Engine Anti-pollution System) developed from AIR (Air Injection with Thermal Reactor) is the new exhaust gas cleaner system designed for the Mazda rotary engines that can meet even the 1975 automotive exhaust gas control criteria. It is a thermal reactor that removes CO and HC by afterburning. The rotary engine equipped with the Mazda REAPS gives CO emission of 6.59 g/km, HC of 0.45 g/km, and NOx of 0.75 g/km, measured by the 10-mode CVS (Constant Volume Sampling) method. A governmental survey made on the reciprocating engine automobiles in 1972 revealed that the CO emission was 21 g/km, the HC 3.9 g/km, and the NOx 3.2 g/km. Compared with the 1975 control criteria of 2.1 g/km for CO, 0.25 g/km for HC, and 1.2 g/km for NOx, the NOx emission is already better with the Mazda REAPS consisting of a thermal reactor unit, air control valve, deceleration control valve, and control unit (small computer). Performance of the rotary engine is so high that operation and driveability of the engine are affected very little by incorporation of the REAPS. The rotary engine also gives optimum performance even with low-octane, no-lead gasoline fuel, causing no such problems as valve recession. The Mazda is in a position to readily meet the 1975 and 1976 criteria set forth in the so-called Muskie Act, using the REAPS system.

29847 **APTIC NO. 51728**

Norbye, Jan P. and Jim Dunne

HONDA S NEW CVCC CAR ENGINE MEETS 75 EMISSION STANDARDS NOW. *Pop. Sci., 202(4):79-81, April 1973.*

Honda has modified the engine to alter the combustion process; the modified Compound Vortex Controlled Combustion (CVCC) car engine meets the EPA standards. Three cars equipped with CVCC engines were tested, and the results of carbon monoxide, hydrocarbons, and oxides of nitrogen data are presented. The CVCC engines have 50,000-mile durability that remains unproved, and the deterioration factor is very small, 31% for CO, 24% for HC, and 21% for NOx. The operation of CVCC is illustrated. The CVCC engine has been optimized for emission control. Bore and stroke were selected to give the desired size and shape to the combustion chamber. Honda will start production of a CVCC car this year, and plans to market in the U. S. in 1974. The tests of the CVCC may strengthen the EPA s resolve to stick to its timetable.

29848 **APTIC NO. 51742**

Oda, Takeshi

PROBLEMS OF POLYMER WASTE INCINERATORS. *(Kobunshikei haikibutsu nenshoro no mondaiten). Text in Japanese. Kobunshi (High Polymers), 22(253):201-205, 1973.*

The combustion of plastic wastes usually generates harmful gases including carbon monoxide, hydrocarbons, hydrogen cyanide, and soot. The problem of pollution by these substances could rather easily be resolved by improving the combustion technique. Hydrogen chloride generated from the combustion of polyvinyl/chloride (PVC) and 0metals such as lead and cadmium which were used as stabilizer or dye cause more problems than the other substances. Gas from the incinerator for the combustion of PVC generally contains about 30,000 ppm of HCl, and a one-stage venturi scrubber can only reduce it to about 600 ppm. Therefore, a two-stage venturi scrubber with water or alkali solution as the washing solution is required.

29849 **APTIC NO. 51996**

Reed, Richard J.

COMBUSTION POLLUTION IN THE GLASS INDUSTRY. *Glass Ind., 54(4):24, 26, 38, April 1973. (Presented at the American Ceramic Society, Glass Division, Oct. 13, 1972.)*

Although the major pollution problem in glass making plants is one of noncombustible particulate carryover, application of radiant burners can minimize the problem in some cases. These burners use convection close to the burner to heat a refractory surface to a temperature at which it is a good heat transfer device. In converting a coal-fired boiler, a short bushy flame is required. The long flame of modern gas and oil burners can impinge on water tubes, resulting in quenched flames, incomplete combustion, and hydrocarbon pollution. Fumes from hydrocarbon binders can be incinerated in flame, thermal, or catalytic afterburners. Combustible liquid wastes can also be incinerated; it is fairly easy to adapt a dual-fuel burner (designed to burn either gas or oil simultaneously) by putting the waste through the atomizer. Gas is used as an auxiliary fuel to preheat the chamber, to ignite the liquid, and to evaporate water in the liquid waste. Solid waste incineration is usually a two-stage process. In the first stage, combustibles are vaporized or gasified in preparation for the second-stage afterburner. Nitrogen oxide emissions can be reduced by lowering the temperature in the bulk combustion region and providing rapid mixing of hot combustion products with cooler furnace gases.

29850 **APTIC NO. 52509**

Reichel, Wolf-Christian

POSSIBILITIES OF IMPROVEMENT OF THE THEORETICAL CALCULATION OF TECHNICAL COMBUSTION PROCESSES FOR SOLID FUELS. *(Moeglichkeiten zur Verbesserung der theoretisch-rechnerischen Erfassung technischer Verbrennungsvorgaenge fuer feste Brennstoffe). Text in German. Energietechnik, 23(6):254-258, June 1973. 6 refs.*

The limited amount of fuel and the increasing power demand in the German Democratic Republic will make the use of low-quality soft coal necessary. The low-quality soft coal has a heating value of only 1500 to 1200 kcal/kg, a water concentration of 55 to 62% and an ash content of the water-free substance of more than 25%. For complete combustion of this coal, relatively low temperatures must be maintained in the combustion chamber. Good control over the combustion process is necessary. Today it can be assumed as certain that there are three characteristic temperature ranges in which changes of the laws governing the oxygen conversion or the combustion occur. At temperatures around 650 C the conversion speed is determined solely by the velocity of the chemical surface reaction. The external and internal fuel areas participate fully in the reaction. With increasing temperature a lack of oxygen develops in the fuel interior. In this temperature range (700 to 900 C) chemical reaction and diffusion takes place. With still higher temperatures diffusion gradually takes over, and temperatures from 1200 C on determine the conversion. On the basis of this, a calculation of the combustion process becomes feasible. Best results were obtained with equations from the field of reaction kinetics. The quantity of heat liberated by each considered volume element is obtained by way of the oxygen consumption and the reference parameters fuel throughput, lower heating value, degree of efficiency of the combustion system, and the fuel to air ratio.

29851 **APTIC NO. 51965**

Roehm, Werner

LIQUID NATURAL GAS AS FUEL. *(Fluessigerdgas als Kraftstoff). Text in German. Gas Wasserfach, Gas Erdgas (Munich), 114(7):350-351, 1973.*

The city cleaning department of Stuttgart has ordered a liquid gas Daimler-Benz truck. Contrary to the diesel engine, the gas-operated engine has an external ignition with an ignition distributor, ignition coil, and spark plugs. It is equipped with six cylinders with a piston displacement of 5.675 l and a compression of 10.5 to 1. Two individual tanks store the liquid gas. Each has a capacity of holding 70.5 l of gas. The liquid gas is evaporated in the converters heated by the cooling water. The gas pressure is reduced to between 80 and 150 mm water and added to the gas mixer where gas and air are mixed according to the desired ratio. The mixture passes a throttle valve, the intake pipe, and enters the cylinder heads where it is ignited. The gas-operated vehicle weighs 142 kg more than the diesel-operated truck. For a power of 101.5 hp, the carbon monoxide concentration in the exhaust gas is 3.3 g/BHPh, that of the hydrocarbons and the oxides of nitrogen 4.4 g/BHPh. The average gas consumption is 52 l gas/100 km. The costs for 100 kg liquid gas are $17 versus $14 for 100 kg of diesel oil.

29852 **APTIC NO. 52274**

Rudolph, M.

COMPARISON OF VARIOUS ROOM HEATING SYSTEMS CONCERNING PRIMARY ENERGY CONSUMPTION AND POLLUTANT EMISSIONS IN THE YEAR 1980. *(Vergleich verschiedener Raumheizungssysteme bezueglich Primaerenergieaufwand und Schadstoffemissionen im Jahre 1980). Text in German. Brennstoff-Waerme-Kraft, 25(3):105-111, March 1973. 1 ref.*

A comparison of the environmental pollution and primary energy demand in 1980 by electric storage heating, individual gas heating, individual oil heating, oil central heating, and coke central heating has been attempted. The heat demand of one room is used as the basis for a comparison of the primary energy demand by the various heating systems. For determination of the annual heat demand certain assumptions such as uniform operation of all heating systems were necessary. For buildings without heat insulation an annual heat demand of 0.654 gigajoule/sq m and for buildings with heat insulation a value of 0.467 GJ/sq m/yr was assumed. After determination of the various degrees of use of the individual heating systems and the degrees of use for obtaining, conversion, and distribution of the various energy carriers, the annual primary energy demand of the various heating systems could be compared. Gas heating and oil central heating have the best results. Another table shows the pollutant emissions. Gas heating emits the lowest amount of pollutants only 10 mg/sq m/yr dust, 0.2 g carbon monoxide, no hydrocarbons, 66 g oxides of nitrogen, and 0.8 g sulfur dioxide. Coke central heating has the highest pollutant emissions, with average values of 249 g for solid particles, 1381 g CO, 229 g hydrocarbons, 193 g oxides of nitrogen and 1170 g SO2. Electric heating and oil heating have about the same amount of pollutant emissions.

29853 **APTIC NO. 52100**

Sadowski, Ryszard

AIR POLLUTION CONTROL AS A TASK OF THE SANITARY ENGINEER. *(Ochrona powietrza atmosferycznego w dzialalnosci inzyniera sanitarnego). Text in Polish. Gaz, Woda Tech. Sanit. (Warsaw), 47(3):101-103, 1973.*

The air pollution in Lublin County was evaluated on the basis of inquiries sent to 1350 plants. High air pollution degree was found in 80 plants, mostly in the districts of Chelm, Rejowiec, Pulawy and Lublin. In the districts of Chelm and Rejowiec, the air pollution is caused mostly by the dust from cement plants; in the district of Pulawy, by ammonia, nitrogen oxide, ammonium nitrate, and sulfur dioxide; and in the district of Lublin, by dust, sulfur dioxide, carbon dioxide, carbon monoxide, and lead compounds. In the winter time the concentration of sulfur compounds in Lublin is O.32 mg/cu m/day. In order to diminish the air pollution in Poland, several precautions were undertaken since 1966. Some of them are discussed related to the specifity of the Lublin county.

29854 **APTIC NO. 52021**

Salman, A. A. and D. N. Bendyamovskiy

STUDYING THE AIR POLLUTANT EMISSIONS GENERATED BY RUBBISH INCINERATION. *(Issledovaniye vybrosa zagryazniteley atmosfernogo vozdukha pri musoroszhiganii). Text in Russian. Gigiena i Sanit., no. 2:91-93, Feb. 1973. 6 refs.*

Physical and chemical properties of the particulate matter emitted by a municipal waste incinerator with an hourly capacity of 400-500 kg were studied. The mineral content of the particulate matter ranged from 86 to 95%. Ash particles smaller than 3-4 micron were detected under a microscope. The fly ash was composed of aluminosilicate with considerable quantities of iron and calcium oxides. Granulometric fractions below 5 micron, 5-10 micron, 10-20 micron, 20-30 micron, and over 30 micron accounted for 9-22%, 10-16%, 13-25%, 6-14%, and 36n54%, respectively.

29855 **APTIC NO. 52453**

Schaefer, Helmut

POWER SUPPLY OF THE FUTURE, RATIONAL OR RATIONED. *(Energieversorgung der Zukunft, rationell oder rationiert). Text in German. Brennstoff-Waerme-Kraft, 25(7):291-295, July 1973. 3 refs.*

The dangers of misinterpretation of facts concerning energy and the environment are outlined in some examples. A too high relation between the global anthropogenic use of energy and the solar energy reaching the earth s surface is given, which hides the actual problem. Thermal pollution is not a global problem, but is first and foremost one of urban and industrial centers. The problem cannot be solved by a world formula, but by measures geared to the individual regional situation. Based on the energy balance for the Federal Republic of Germany for 1970, ways of better energy use for traffic are outlined. Of the total primary energy supply, about 21% is consumed by losses, the self-demand for preparation, conversion, and transport of the energy carriers. Of the remaining supply, 59% reaches the consumer. Household and small consumers consume 26%, industry 23%, and traffic 10%. The future development of energy losses will be determined by traffic which doubles its energy demand within 7.5 years. Its degree of power utilization of 15% is far below that of industry with about 55%. The losses are highest for automobiles in city traffic. This loss can be reduced by the use of electric power for automobiles and limitation of individual passengers cars. This would at the same time reduce pollutant emissions. Ways of utilizing the waste heat from thermal power generation are reviewed. Utilization of this waste heat is only worthwhile if the recycled waste heat substitutes for primary or secondary energy.

29856 **APTIC NO. 52508**

Schneider, Werner

CORROSION AND INJURIES FROM EMISSIONS CAUSED BY THE WASTE GASES OF INCINERATORS. *(Korrosionen und Immissionsschaeden durch Muellrauchgase). Text in German. Energietechnik, 23(6):277-280, June 1973. 31 refs.*

In the German Democratic Republic at present about five million tons of waste accumulate annually which are dumped. Since this amount will increase, incineration will gain increasing importance. Dusts and odors from incinerators can be satisfactorily treated. Great problems are still posed by gaseous pollutants and by corrosion. Since the waste gases from incinerators contain only about 0.03% of sulfur dioxide and the developing sulfur trioxide is bound by the high amount of fly dust (10 to 40 g/cu m), high temperature corrosion by alkali iron sulfate melts can be ruled out. Studies revealed that high-temperature corrosion in incinerators is mainly caused by hydrogen chloride in a reducing atmosphere. Low-temperature corrosion may be caused in incinerators by hygroscopic and easily melting zinc chloride and iron chloride hydrates. The emission of HCl at present amounts to between 0.5 and 1 g/cu m. The maximum allowable emission concentration for HCl is 0.015 or 0.05 mg/standard cu m. Efforts concerning the reduction of the emission of this pollutant are aimed at the replacement of polyvinyl chloride by other chlorine-free synthetics. The binding of HCl to calcium oxide or the removal by scavenging processes are also methods under consideration. Apart from this pollutant, the incineration waste gases also contain hydrogen fluoride in quantities up to 10 mg/cu m. This pollutant deserves special attention in future at the planning of new incinerators.

29857 **APTIC NO. 52428**

Schutz, L. A., Walter Bank, and George Weems

AIRBORNE ASBESTOS FIBER CONCENTRATIONS IN ASBESTOS MINES AND MILLS IN THE UNITED STATES. *Bureau of Mines, Denver, Colo., Denver Technical Support Center, Bureau of Mines Health and Safety Program Technical Progress Report 72, 17p., June 1973. 4 refs.*

Investigations were conducted in the principal asbestos mines and mills in the United States to determine the concentration of airborne asbestos fibers in the workplace, and to establish the exposure of workers to such fibers. Surveys were conducted using sampling and evaluation methods consisting of collecting the airborne sample on filters and, after appropriate sample preparation, counting the fibers utilizing phase contrast microscopy. The survey procedures are described and the results discussed in detail. It was determined that fiber concentrations are low in the asbestos mines but high in the asbestos mills, rangine well above 5 fibers/ml of air based on a count of fibers greater than 5 micron in length. (Author abstract)

29858 **APTIC NO. 51832**

Sehmel, G. A.

PARTICLE RESUSPENSION FROM AN ASPHALT ROAD CAUSED BY CAR AND TRUCK TRAFFIC. *Atmos. Environ., 7(3):291-309, March 1973. 15 refs.*

Particle resuspension caused by moving-vehicular-generated surface stresses was determined by using solid zinc sulfide tracer particles placed on a road. The ZnS particles less than 25 millimicron in diameter, were initially placed on a test area 10 ft by 100 ft on one lane of a two-lane, seasoned, asphalt road. To measure particle resuspension at a constant vehicle speed, either a car or a 3/4-ton truck was driven in the lane through the tracer area or in the lane adjacent to the tracer area. The fraction of particles resuspended from the road by the surface stresses was determined using a tracer mass balance. For the mass balance, the downwind airborne tracer exposure and tracer ground deposition were measured. The fraction of tracer particles resuspended was normalized for each vehicle speed by the number of times (passes) the vehicle was driven the length of the test area. The fraction of particles resuspended per vehicle was determined for separate vehicle speeds of 5, 15, 30, and 50 mi/hr. The fraction resuspended per vehicle pass was from 0.00001 to 0.01 with the greater resuspension corresponding to increased vehicle speed and driving directly through the deposited tracer. For constant vehicular conditions and no intervening traffic, the fraction of particles initially present which were resuspended decreased markedly with an increase in days after the tracer was placed on the road. (Author abstract modified)

29859 **APTIC NO. 51862**

Shinagawa, Yoshihiro

LP GAS AS A NONPOLLUTING ENERGY SOURCE -- ITS PRESENT SITUATION AND VIEW. *(Mukogai enerugi to shiteno erupi gasu -- sono genjo to tenbo). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(2):4-13, Feb. 1973. 6 refs.*

Industrial demand for liquid petroleum gas (LPG) was 1,476,000 tons in 1971, up 26.8% from 1970. The chief factor contributing to the increase is the nonpolluting nature of LPG. The LPG is now being used as a substitute for heavy oil, as well as a special fuel. Electric power and steel industries are using more LPG. Thus, LPG, liquefied natural gas, and naphtha are expected to be more in demand in the future. The LPG has 0.005% sulfur. Increased LPG supplies and increased transportation capacity are important in the future.

29860 ***APTIC NO. 51880***

Sugiura, Kensuke

FUELS, LUBRICANTS, AND GREASES. (Nenryo, junkatsuyu oyobi guriisu) Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(6):660- 665, June 1973. 176 refs.

In 1972, the total petroleum supply in Japan was 204.5 million kl, a 4.6% increase from the previous year. Gasoline accounted for 8.7% of the total, naphtha for 10.2%, jet fuel and lamp oil for 10.9%, and heavy oil for 54.6%. Consumption of heavy oils containing comparatively high sulfur content decreased. Imported oil increased by 7.8% over the previous year. Pollution control programs included importation of low-sulfur oil, introduction of liquefied natural gas, and desulfurization of heavy oil and stack gas. The Central Public Nuisance Study Council has recommended new emission standards for gasoline vehicles for 1975 of 2.1 g/km carbon monoxide, 0.25 g/km hydrocarbons, and 1.2 g/km nitrogen oxides. The number of vehicles in Sept. 1972 was 22.55 million, of which gasoline vehicles numbered 19.44 million. Gasoline consumption was 24.32 million kl for automobiles. Leaded and non-lead gasoline, diesel fuel, lubricants and greases, gear oil, and transmission oil are also discussed.

29861 **APTIC NO. 51881**

Sugiyama, Hiroshi and Kiejiro Kinoshita

POWER PLANTS, INCLUDING PROSPECTIVE PRIME MOVERS. *(Sonotano doryoku). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(6):623-629, June 1973.*

Electric automobiles, Stirling engines, gas turbines, and other alternative power sources are described. Lead acid batteries are not promising because their low energy densities amount only to 25-30 Wh/kg; they can only supply power for 40-100 km/charging. Other types of batteries are being studied. Fuel cells, hybrid systems, and Stirling engines are mentioned. Gas turbines are now being tested for use in cars, tractors, and buses. The Environmental Protection Agency is sponsoring development programs for the gas turbine.

29862 **APTIC NO. 52196**

Szabo, Maria, Katalin Kollar, and Maris Fejes

EVOLUTION OF THE FUEL CONSUMPTION AND AIR POLLUTION IN BUDAPEST IN THE 1966-1971 PERIOD. *(A fovarosi tuzeloanyag felhasznalas es a levegoszennyezettseg alakulasa az 1966-1971. evekben). Text in Hungarian. Budapesti Kozegeszsegugy, no. 1:22-25, 1973.*

The evolution of the fuel consumption and the air pollution due to settling dust and sulfur dioxide in Budapest in the 1966-1971 period is surveyed. While the total amount of calorific value consumed remained the same during the 1966-1971 period, the solid fuel consumption was reduced to 54% due to a spectacular increase in fuel oil and natural gas consumption. The specific consumption by industry decreased, and that of households and institutions increased during the same period. No direct relationship between the evolution of the air pollution and that of fuel consumption was observed, which is due to the effect of several meteorological factors. The SO2 pollution shows a falling trend, while the settling dust concentration is rising, which is attributed to increased traffic density and an increased number of construction sites. Elevated dust and sulfur emissions during the heating periods, and reduced dust and SO2 concentrations is new housing projects with remote heating were measured.

29863 **APTIC NO. 52458**

Takagaki, Tokujiro

AUTOMOTIVE EXHAUST GAS POLLUTION AND FUEL BATTERY-POWERED AUTOMOBILES. *(Jidosha haigasu kogai to nenryodenchi jidosha). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):67-73, Jan. 1973.*

Pollution problems caused by the automotive exhaust gas will be completely solved only if automobiles are powered tteries. Lead acid or alkaline batteries have so small an energy density (30-35 Wh/kg) that they cannot power an automobile for long-distance driving. A silver-zinc battery gives a greater energy density of 100 Wh/kg, but its disadvantages are the short life and high cost. Several new storage batteries including zinc-air and sodium-sulfur batteries are being developed which are hoped to give 150 Wh/kg or higher energy density necessary for the ordinary driving distance of a present passenger car. On the other hand, a fuel battery is more suitable as the prime mover power source of an electric automobile in that electric energy can be taken out of it as long as it is supplied with fuel, thus requiring no charging. Two representative types of fuel battery, hydrogen-oxygen (air fuel battery) and hydrazine-oxygen (air) fuel battery, are outlined. A hydrogen-oxygen fuel battery uses porous carbon electrodes, another uses porous sintered nickel plates for both the oxygen (positive) and hydrogen (negative) electrodes. A fuel battery is ideally suited for a use in which a large output is continuously taken out, but not necessarily ideal when it is required of an unusually large output, as in case of the peak load. It is not sensitive enough to follow drastic changes in load and is often adversely affected by such drastic changes. To solve this problem, a hybrid system consisting of a fuel battery and a lead acid battery is being considered. An example of such a hybrid application is shown.

29864 **APTIC NO. 52107**

Thakur, Pramod C. and A. K. Sinha

A RESPIRABLE DUST INDEX FOR U. S. COALS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 16p., 1973. 15 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-F-17.)*

Eighteen samples of coal covering the range from anthracite to linite were studied for the yield of respirable dust. Equal weights of uniformly sized samples from various coat types appear to yield varying amounts of respirable dust for the same energy consumption. An index, which measures this property of coal was developed and called the Respirable Dust Index (RDI) of the coal. This index appears to be a function of various chemical and petrological properties of coal, including moisture and volatile content. The yield of respirable dust seems to increase with increasing fixed carbon and fusain content, and to decrease with increasing ash content and grindability. The exponential relation between the RDI and properties of coal as sugested in literature does not appear to be very strong.

29865 **APTIC NO. 51771**

Thomson, D. A. and W. Strauss

TOTAL EMISSIONS TO THE AUSTRALIAN ATMOSPHERE. *Clean Air, 7(1):18-20, Feb. 1973. 6 refs.*

Air pollution emission sources and total emissions in Australia have been estimated. They are approximately 1 ton/person/yr, almost the same as in the U.S.A. The spark ignition engine motor car is responsible for 39% of all emissions, or 49% of the gaseous emissions. Present motor car density in Sydney and Melbourne is similar to Los Angeles in 1943, when smog was first observed there. Australian sulfur dioxide emissions with the approximate values for the Southern Hemisphere show that Australia produces 11.6% of the SO2 from coal and 26% of SO2 from petroleum products. When SO2 from other sources, mainly smelting, is added to the total, Australia is responsible for 15% of the SO2 pollution in the Southern Hemisphere, or about 1% of the world total. Sources are listed for particulate, SO2, carbon monoxide, hydrocarbon, and nitrogen oxide emissions; including coal and fuel oil combustion, vehicles, petroleum refining, iron/steel and non-ferrous metal industries, mineral products, agriculture, forest fires and waste disposal.

29866 **APTIC NO. 52441**

Yanagihara, Shigeru, Kunio Suzuki, and Kazunari Saneto

COMBUSTION EXPERIMENT OF A SMALL SIZE BOILER. *(Kogata boira no nensho jikken). Text in Japanese. Preprint, Japan Automobile Research Inst., Tokyo, p. 43-52, 1973. 2 refs. (Presented at the Japan Automobile Research Institute, Study Meeting on Automobile Technology, 8th, Tokyo, Japan, Nov. 22, 1973.)*

A boiler was tested to determine if the Rankine cycle engine could meet the Muskie law requirements for automobile emissions. The combustor structure, operation, and fuel were studied as variables affecting nitrogen oxides emissions. The boiler studied had a maximum engine output of 50 hp, engine heat efficiency of 20%, combustion heating value of 1.5times 10 to the 5th kcal/hr, and a combustion load factor of 7 to 8 times 10 to the 6th kcal/cu m/hr. The fuel flow rate was constant, the air flow rate was varied, and the air/fuel ratio was 18 to 33. The trend was similar for hydrocarbons and carbon monoxide; the minimum values occurred at an air/fuel ratio of 23. The range of the air/fuel ratio within which the HC and CO concentrations become small is not wide. When the air/fuel ratio was kept constant and the flow rate of the fuel was changed, the NOx change was small and the CO trend indistinct.

29867 **APTIC NO. 52442**

Yanagihara, Shigeru

PROBLEMS OF THE RANKINE CYCLE CAR COMBUSTOR. *(Rankin saikuru jidosha-yo nenshoki no mondaiten). Text in Japanese. Preprint, Japan Automobile Research Inst., Tokyo, p. 23-34, 1973. 11 refs. (Presented at the Japan Automobile Research Institute, Study Meeting on Automobile Technology, 8th, Tokyo, Japan, Nov. 22, 1973.)*

Rankine engines can reduce automobile exhaust emissions. Generally catalytic afterburners are not considered for use with Rankine (steam) engines. The Rankine engine has the advantage that it can be cooled with an operating fluid. When the air/fuel ratio comes near its theoretical mixing ratio, the heat transfer to the exhaust gas becomes small and the loss of power becomes small, but the level of nitrogen oxides increases above the target value. If the exhaust gas concentration is controlled within the target value of lambda less than 1.2, the combustor is satisfactory. Although the Rankine engine has the defects that the heat efficiency is low and the output is small, it is still a good low-pollution engine.

29868 **APTIC NO. 52316**

Zanker, Adam

NOMOGRAPH FOR THE ESTIMATION OF FUEL-GASES VOLUME, OBTAINED BY COMBUSTION OF COMMON SORTS OF FUEL. *Erdoel Kohle (Hamburg), 26(6):351-352, June 1973.*

A nomograph is presented which can estimate the flue gas volume with relatively good accuracy by using three movements of a ruler. The nomograph is based on several assumptions, including that combustion is ideal and no carbon monoxide is formed. The nomograph is applicable to coals, fuel oils, natural gas, kerosene, gasoline, propane, fuels whose mineral content does not exceed 8% weight, and all fuels with a total oxygen plus nitrogen content not exceeding 2% weight. Several examples are discussed.

29869 **APTIC NO. 52286**

Zembrzuski, Mieczyslaw and Henryk Karcz

COMBUSTION OF THE PETROGRAPHICALLY DIFFERENT FRACTIONS OF SOFT COAL. *(Ueber die Verbrennung petrographisch unterschiedlicher Anteile von Braunkohle). Text in German. Energietechnik, 23(6):258-261, June 1973. 6 refs. (Presented at the Waermetechnischen Kolloquiums, Magdeburg, East Germany, Aug. 30-31, 1972.)*

The results of combustion tests with four petrographic fractions of soft coal, earthyl coal, brittle xylite, pyropissite, and fusite, are discussed. For each fraction about 800 combustion tests were performed. The grain size was between 150 and 1500 micron. The combustion process was recorded photographically. The combustion times of the four petrographic fractions were different even though the grain size was the same. The grains of pyropissite and fusite burned with a speed ratio of one to three. This shows that losses of unburned fuel in pulverized coal-fired combustion chambers occur primarily with those petrographic fractions which require a large activation energy and which have high reaction velocity constants.

1972

29870 **APTIC NO. 52125**

Tokyo Metropolitan Government (Japan), Edogawa Ward Public Nuisance Control Section

REPORT OF FUEL SURVEY RESULTS. *(Nenryo chosa kekka hokokusho). Text in Japanese. 8p., Oct. 1972.*

Since heavy oil combustion is the main cause for air pollution, fuel consumption by industries in Edogawa Ward, Tokyo, were surveyed to determine data for establishing effective pollution control methods. Of the 898 industries investigated, 207 used heavy oil. About 45% of these were located in the Matsue and Chuo districts, both industrial areas. About 68% of the firms consumed 1000 l/day of oil. Such industries are not subject to municipal ordinances. This indicates a need to control such industries in the near future. The 30 factories which violated emission standards used B heavy oil; they should change to better quality oil. Only larger factories were equipped with dust collectors; most smaller factories had no dust collectors, due to the high cost of such equipment. More economical dust collectors will have to be developed before they can install them.

29871 **APTIC NO. 52003**

Bethea, R. M. and R. S. Narayan

IDENTIFICATION OF BEEF CATTLE FEEDLOT ODORS. *Trans. ASAE (Am. Soc. Agr. Engrs.), 15(6):1135-1137, Nov.-Dec. 1972. 10 refs.*

The qualitative nature of the gases present in the atmosphere around a beef cattle feedlot was determined. Specific identification within each functional class of compounds identified was performed by gas chromatography. Environmental chamber studies were carried out to evaluate the effect of different methods of chamber management on the distribution of evolved gases. The methods included cleaning and washing the chamber daily, shoveling out manure, and no cleaning. A representative pair of chromatograms from each set of three runs made during each scheme of chamber management was evaluated using the multi-column gas chromatography data reduction and analysis computer program. During the first phase of chamber management, only a few odoriferous contaminants were generated. Acetaldehyde and butyraldehyde were the most noxious compounds present in these compounds. Carbon dioxide, carbon monoxide, ammonia, and hydrogen sulfide were also present under all conditions. Alcohols, carbonyls, amines, and sulfur compounds were measured in the odorous emissions.

29872 **APTIC NO. 52288**

Cole, Robert H.

FEASIBILITY STUDY OF FLYWHEEL URBAN VEHICLE. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 6p., 1972. (Presented at the American Association for the Advancement of Science,* *Annual Meeting, 139th Washington, D. C., Dec. 26-31, 1972.)*

Steel and carbon fiber flywheels were unsuccessfully tested as alternatives to the internal combustion engine. A four-cylinder engine converted to run on propane gas and equipped with catalytic reactors met all 1975 Federal emission standards, 1976 standards for carbon monoxide and hydrocarbons, and fell short of the 1976 standard for nitrogen oxides by 0.4 g. Platinum-based converters were used for the oxidation of CO and HC and nickel-copper alloy converters for reduction of NOx. Safety features of the car included an overlapping door configuration and a wrap-around seat design. Based on a telephone survey, there is a potential market for small urban vehicles if low cost and large luggage space can be combined.

29873 **APTIC NO. 52307**

Curry, David A. and Dudley G. Anderson

AIR POLLUTION AND NOISE EFFECTS. *In: Procedures for Estimating Highway User Costs, Air Pollution, and Noise Effects. Stanford Research Inst., Menlo Park, Calif., National Cooperative Highway Research Program Rept. 133, p. 37-46, 1972.*

Procedures for estimating the magnitude of air pollution and noise effects on the community from the operating vehicles over the highway facilities are described. Although the most effective reduction of motor vehicle air pollution probably will come from modifications to automobile designs or limitations on their use, highway planners can contribute to pollution abatement by designs such that emissions per vehicle-mile are reduced by increasing speeds and reducing the number of speed changes. Peak concentrations are reduced by spreading traffic over time. To describe adequately the effect of air pollution, the highway designer needs to know the trade-offs between the usual design parameters such as highway cost, travel times, speed changes, vehicle costs, and related air pollution effects.

29874 **APTIC NO. 51843**

Dutkiewicz, B. and P. H. Spitz

PRODUCING SNG FROM CRUDE OIL AND NAPHTHA. *Chem. Eng. Progr., 68(12):45-50, Dec. 1972.*

The technology available for gasification of crude oil-derived feedstocks is reviewed. The best route for producing substitute natural gas (SNG) from hydrocarbon feedstocks boiling below 370 F is catalytic steam reforming followed by methanation of the product gas. More than 70 steam reforming plants are in operation in Europe and Japan, based on the Catalytic Rich Gas, Lurgi, and Methane Rich Gas processes. For heavier feedstocks, a combination of a hydrogenation step and hydrogen rich gas generator is required. Feedstocks up to 500 F endpoint can be processed by high-temperature steam reforming (to yield hydrogenation gas) and the GAS Recycle Hydrogenation (GRH) process. The high hydrogen content of the product gas dictates additional processing to meet flame speed requirements. Middle distillates with boiling points between 500-650 F are processed by steam reforming or partial oxidation to yield H2 followed by GRH hydrogenation. Again, further processing of the raw gas from the hydrogenation unit is required. For feedstocks heavier than 650 F, partial oxidation is used in combination with the Fluid Bed Hydrogenation (FBH) process. Another alternative for conversion of heavy feedstocks or whole crudes is coking of the heavy residue with subsequent gasification of the coke to produce a low Btu gas for plant consumption. Capital investment and production costs for the four gasification methods are compared. Factors influencing the costs for gasification of higher boiling point feedstocks include increased hydrogen addition/carbon removal duty and increased gas purification duty, particularly in respect to sulfur removal. Coproduction of liquid fuels would result in a simpler and more economical processing when feeding heavy feedstocks.

29875 **APTIC NO. 52266**

Ferri, Antonio

BETTER MARKS ON POLLUTION FOR THE SST. *Astronaut. Aeronaut., 10(7):37-41, July 1972.*

Arguments are given against the contention that the exhaust gases of a suspersonic transport or other aircraft using conventional chemical fuels could be prohibitive because of the damage to the upper atmosphere through water and nitrogen oxide pollution. Research results are cited which indicate that the water vapor produced by an SST has no positive harmful effect on the upper atmosphere. As a consequence, the SST engine can now be investigated in terms of acceptable levels of nitrogen oxides as a pollution problem. The nitrogen oxides in exhausts can be reduced to 1 or 2 ppm by advanced technology.

29876 **APTIC NO. 52277**

Gotsu, Isamu, Hiroshi Kagawa, Kunihiko Hasumi, Yasuo Abe, Toshimasa Maniwa, Kojiro Shimanuki, Masaaki Suzuki, Satoshi Itohara, Hiroyasu Watanabe, Kenji Anzai, Ichiro Iwahashi, Fumio Sato, Sobei Tanji, Ryoji Ochiai, Wasaburo Kawakami, Yokio Abe, and Takao Michiyama

INVESTIGATION OF LOCAL AIR POLLUTION IN CONCENTRATED AREA OF TILE MAKING INDUSTRY IN FUKUYAMA DISTRICT, KORIYAMA CITY. *(Koriyama-shi Fukuyama chiku ni okeru kawara kojo chitai no taiki osen (SOx oyobi HF) chosa ni tsuite). Text in Japanese. Fukushima-ken Eisei Kenkyusho Kenkyu Hokoku (Fukushima Prefect. Inst. Public Health, Rept.), 20(4):91-98, Oct. 1972. 14 refs.*

The efficiency of an exhaust gas treatment method in the tile making industry was investigated as well as the concentration of hydrogen fluoride in the atmosphere around tile making plants. Four plants were investigated. The rate of treatment efficiency of exhaust gas (sulfur oxides) from the tile making industries was 87% (A), 77.8% (F), 75% (C), 74.7% (D), and 69.4% (B). The rate of treatment efficiency for hydrogen fluoride was 96.2%, 91.3%, 90%, and 89.7% respectively. The average concentration of hydrogen fluoride in the atmosphere around the plants was determined to be 0.025 ppm (C and F), 0.005 ppm (D), and 0.00 ppm (E). Atmospheric hydrogen fluoride concentrations were measured continuously by automatic apparatuses for five days and nights. The average HF concentration in homes near the industries was 0.05 ppm near D, 0.04 ppm near A, 0.03 ppm near B, and 0.01 ppm near C.

29877 **APTIC NO. 51903**

Hammond, Dean Crain, Jr.

ANALYTICAL MODELLING OF GAS TURBINE COMBUSTORS. *Purdue Univ., Lafayette, Ind., Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972, 212p. 146 refs.*

An analytical model to define the gas-phase processes was developed for gas turbine combustors with the perfectly stirred reactor constituting the basic computational component. The combustion of realistic fuels was best handled using a quasi-global mechanism, i.e., a global partial oxidation reaction coupled with a wet carbon monoxide oxidation mechanism. The Zeldovich mechanism was the appropriate characterization of nitric oxide formation within the N-O system, and included the coupling reaction of monoatomic nitrogen with the hydroxyl radical. The model was used to make predictens for turbojet combustors, and the resulting data were compared with actual measurements of temperature and CO and NO concentration. The kinetics model and flow model are described. Model modifications to include heterogeneous processes occurring in gas turbine combustors were examined. (Author abstract modified)

29878 **APTIC NO. 51848**

Hirao, Osamu

ALTERNATIVE ENGINES. III. *Ingrs. Automobile (Paris), 10(27):553-555, Oct. 1972.*

Electric automobiles, gas turbines, steam engines, and Stirling engines are inferior to internal combustion engines with respect to thermal efficiency, power performance, energy density, ease of control, and economy. Therefore, internal combustion engines such as 2 and 4 cycle reciprocating engines, diesel engines, and rotary engines will remain the prime movers of automobiles for the next 10-15 years. Purification devices ensuring completely harmess exhaust are available, although they remain to be produced at the lowest possible cost. In terms of emission at a given air-fuel ratio, the Nitrogen oxides emission of rotary engines is 1/2 1/3 that of a reciprocating engine. In terms of emission per mileage, rotary engines are not especially superior to reciprocating engines. However, the former leave enough space and weight allowance for installing an exhaust purifier. Furthermore, their manufacturing process can be easily automated and their noise and vibration levels are low.

29879 **APTIC NO. 52020**

Kettani, M. Ali and Lenine M. Gonsalves

HELIOHYDROELECTRIC (HHE) POWER GENERATION. *Solar Energy, 14(1):29-39, Dec. 1972. 9 refs.*

Solar energy can be efficiently converted into electricity by transforming it into hydraulic energy as in nature. This can be done artificially when the topographical and hydrological conditions are favorable. For instance, Dawhat Salwah of the Arabian Gulf (Persian Gulf) can be transformed easily into a large water reservoir, by building a dam from Saudi Arabia to Bahrain, and another from Bahrain to Qatar. Because of evaporation, the level of the closed reservoir will tend to decrease, inducing a flow to move from the open sea, to restore the level to its initial value. Therefore the flow of water evaporated by the sun is transformed into a discharge from the open sea to the closed reservoir. Solar energy of evaporation has thus been transformed into hydraulic energy. If a physical head is set between the two levels, the potential energy thus formed by the discharge, falling along the head could be transformed into electrical power. The value of this power is related to the physical and meteorological characteristics of the chosen closed basin. The entire system is studied theoretically as an electric generator package, by maximizing parameters for optimum energy conversion efficiency. (Author abstract modified)

29880 **APTIC NO. 51852**

MacMahon, J. F.

FLUIDIZED BED HYDROGENATION PROCESS FOR SNG. *Chem. Eng. Progr., 68(12):51-54, Dec. 1972.*

The British Gas Council Fluidized Bed Hydrogenation (FBH) process provides a means of producing substitute natural gas from whole crude oil or crude oil fractions boiling above naphtha. The FBH unit consists of a reaction and quench system, gas purification and secondary hydrogenation areas, and a gas drier. Preheated oil and hydrogen gas are reacted in a fluidized bed of coke particles, producing a rich gas with a high concentration of methane and ethane. This gas is quenched with a circulating stream of light aromatics to effect separation of normally liquid products. Hydrogen sulfide is removed from the rich gas in an absorption-stripping system and converted to elemental sulfur in a Claus plant. In the secondary hydrogenation section, the purified gas is contacted with a catalyst in a fixed-bed reactor. Ethane contained in the gas reacts with hydrogen to produce methane. Where there is an excess of hydrogen in relation to ethane, carbon dioxide or hydrocarbons such as liquefied petroleum gas are added upstream of the secondary hydrogenation step. This results in product gas containing less than 5 mole% hydrogen. Aniticipated yields of the FBH process are shown for gas oil, vacuum distillate, crude oil, and deasphalted oil feedstocks. Capital investment costs are given for a 269 million std cu ft/day plant with crude oil feedstock. The feedstock represents about 65% of the net $82.4 million production costs and about 53% of the 20-year average selling price of $101.1 million.

29881 **APTIC NO. 51877**

Mattison, Berwyn F., Daniel V. Cotter, Harry Carter, and Leslie Fisher

MONOXIDE SLIGHT HAZARD IN MOBILE HOMES: FIRE DANGER HIGH. *J. Environ. Health, 35(1):66-68, July/Aug. 1972.*

Seven hundred and fifty-nine of the 3400 mobile home units in Saratoga County, New York, were inspected for carbon monoxide and fire hazards. Tests for CO were performed with dark spot indicators and mine safety CO tube testing outfits. Data on heating units, fuel used, electric appliances, and window and door exits were recorded on especially designed inspection forms. No appreciable CO levels were found, but the fire risk was high. A majority of the furnaces (705) used kerosene or oil as fuel. Only 479 furnaces had thermal shutoff, and 170 had not been cleaned. In 60 instances, there was gravity feed for an elevated outside fuel storage tank, and 181 units lacked any outside fuel line shutoff valve. Other potential fire hazards included extra space heaters, metal doors, faulty wiring, and inadequate electrical connections. Windows in most homes were useless for emergency escape. Most hot water heaters and all refrigerators were electrically powered, yet on-site inspection of electrical appliances is not required in the area.

29882 **APTIC NO. 52087**

Miyanohara, Takashi

THE PRESENT CONDITION AND PROBLEMS OF HYDROGEN CHLORIDE GAS EMISSION FROM URBAN WASTE INCINERATORS (RELATIONSHIP WITH THE RISE OF PLASTIC CONTENT IN WASTE). *(Toshi gomi shokyakuro kara no enka suiso gasu haishutsu no jittai to mondaiten (toku ni purasuchikku konnyritsu josho to no kanren)). Text in Japanese. In: Report on the Studies of Control Measures for Hydrogen Chloride Gas from Waste Incineration, 1971. Japan Public Health Assoc., p. 1-17, March 1972.*

During January through March 1972, investigations were conducted on the state of hydrogen chloride formation caused by incineration of plastic-containing municipal waste, at various municipal incinerators in Kanagawa Prefecture. Samples were taken from furnace flues just before dust collection, and from stack gases at the closest locations at the top of stacks, in order to see the HCl concentration emitted in the air. The method designated by the Japanese Industrial Standard K0107-1967 was used for analyses. The HCl concentration in stack gas, gas composition, and combustion conditions are presented for both continuous combustion incinerators and batch type combustion incinerators. The samplings from continuous combustion incinerators had 500-900 ppm of HCl. Other more recent measurements also ranged between 250 and 940 ppm, and it may be considered that the present state of HCl formation by this type of incinerator is less than 1000 ppm. The concentration of HCl at the exit of the batch type incinerators ranged between 58-839 ppm, and much fluctuation was noted. It was generally less than 200 ppm, and was much less than continuous combustion type incinerators. However, it was conjectured to be the result of excess air supplied to the batch-type combustion incinerator which dilutes the total HCl before emission. The HCl formation weight calculated from the concentration ranged between 2.25 g HCl/kg of waste and 5.48 g HCl/kg.

29883 **APTIC NO. 52393**

Muzio, L. J., D. S. Smith, and E. S. Starkman

EMISSION-ABSORPTION TEMPERATURE MEASUREMENTS IN THE CYLINDER OF A SPARK IGNITION ENGINE. *Combustion Flame, 18(3):315-319, June 1972. 9 refs. (National Air Pollution Control Administration Grant AP-385, Air Pollution Special Fellowship AP39,220-02.)*

Emission-absorption techniques in both the ultraviolet and infrared regions of the spectrum were used to measure the temperature of the combustion gases in the cylinder of an operating reciprocating engine. Measurements in the ultraviolet region at 3064 A yielded erroneously high temperatures. Measurements made in the direction of flame travel showed clearly the temperature gradient which is known to exist. Emission-absorption temperatures determined in the infrared region between 1.5 and 2.5 micron yield reasonably reliable results. The best measurements are obtained at 2.5 micron, where the transmittance was of the order of 0.3. (Author abstract modified)

29884 **APTIC NO. 52420**

Okake, Ryoji

VARIOUS FUELS AS INDUSTRIAL ENERGY SOURCES. *(Kogyoyo enerugigen to shiteno kakushu nenryo ni tsuite). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 14(6):285-292, Dec. 1972.*

The theory of energy, calorific values of fuels (oil, natural gas, fuel gases, coals, wood, charcoal, and nuclear fuels), and energy supply are discussed. Energy demand is expected to be 3.9 times 10 to the 15th power kcal in 1975 and 8.24 times 10 to the 15th power kcal in 1985 (with a GNP growth rate of 8.5%/yr). The environmental pollution control standards for sulfur oxides and nitrogen oxides are discussed with respect to their effects on the sulfur content of fuel. New, pollution-free fuels include liquefied natural gas, synthetic natural gas, liquefied petroleum gas, naphtha, and methanol.

29885 **APTIC NO. 52368**

Pulsifer, Allen H. and Thomas D. Wheelock

PRODUCTION OF HYDROGEN FROM COAL CHAR IN AN ELECTROFLUID REACTOR. *Ind. Eng. Chem. Process Design Develop., 11(2):229-237, April 1972. 13 refs. (Presented at the American Chemical Society, Division of Petroleum Chemistry, 161st Meeting, Los Angeles, Calif., March 1971.)*

A potential industrial process for producing a hydrogen-rich synthesis gas by reacting coal char (pure carbon) and steam in an electrofluid reactor is described. The characteristics of this type of reactor are reviewed, and a reaction model which appears to fit experimental results is proposed. Product gas compositions and energy requirements predicted by the model for the gasification process are presented for various possible operating conditions. The present state of development of the reaction system and foreseeable problems which must be worked out are reviewed. The adaptation of the process to the production of various products such as hydrogen, methane, and methanol is discussed. (Author abstract)

29886 **APTIC NO. 52112**

Soda, Reisuke

EXHAUST GAS. 3. SAFETY MEASURES FOR ORGANIC GASES. *(Yuki gasu no anzen taisaku). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(11):1551-1564, Nov. 1972. 19 refs.*

Organic gas pollution frequently occurs when volatile organic solvents are transferred or discarded. Hydrocarbon gases also occur when plastics are burned. Organic gases invade the human body through the respiratory system, digestive system, and skin. Hydrophilic gases are mainly distributed on membranes, hydrophobic gases are distributed in the brain, nerves, and liver. Acute and chronic poisoning can occur. The maximum allowable concentration and the odor threshold are frequently comparable to one another and are useful guides. Maximum allowable concentrations for short-term exposures are several times larger than the allowable concentrations for long-term exposures. Hydrocarbon toxicity, sampling, and control methods are briefly mentioned.

29887 **APTIC NO. 51984**

Tewarson, A.

SOME OBSERVATIONS ON EXPERIMENTAL FIRES IN ENCLOSURES, PART II- ETHYL ALCOHOL AND PARAFFIN OIL. *Combustion Flame, 19(3):363-371, Dec. 1972. 7 refs.*

Results are presented for burning rates, temperatures, and gaseous products for experimental fires of ethyl alcohol and paraffin oil in a 0.2 cu m partially ventilated enclosures. Four regions, similar to those found for wood fires, can be characterized. A critical condition, very similar to wood fires, corresponding to extreme danger, can be identified by a simple equation. Extension and contraction of flames are defined in terms of temperature and product distribution inside the enclosure. Vertical temperature distribution is used to show the shifting of the approximate interface between hot products and air. Products start contaminating air which enters the fire at the critical condition.

29888 **APTIC NO. 52314**

Yanko, P. I. and L. G. Madoyan

INVESTIGATING THE COMPOSITION OF THE GAS MEDIUM IN A PK-41 BOILER FURNACE WHEN BURNING HIGH-SULPHUR-CONTENT OIL. *Thermal Eng. (English translation from Russian of: Teploenergetika), 19(7):69-73, July 1972.*

The results of investigations into the dependence of the composition of the gas medium at the side wall of the lower radiant section of a PK-41 boiler on the excess air factor at the outlet of the reheater, the method of atomizing the oil, and the cutting out or switching over the end burners to gas are reported. A distinguishing feature of the construction of the PK-41 boiler is a double-sided throat, dividing the furnace into a combustion chamber and cooling chamber. The atomization method exerts a considerable influence on the absolute value and nature of the distribution of the gas constituents of the furnace medium. The severest corrosion of the metal surface of the waterwall tubes occurs in the zone of the semi-reducing medium.

29889 **APTIC NO. 52294**

Zraket, Charles A.

ENERGY, RESOURCES AND THE ENVIRONMENT. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 37p., 1972. 26 refs. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

Adequate clean energy for the long term (post-1985) can be obtained through a combination of restraint and conservation, investment money, new technology (breeder reactors, fusion power, coal gasification and liquefaction, solar energy, geothermal energy), and new discoveries. The present energy crisis has been brought about primarily by institutional weakness and not a lack of potentially available resources or energy options. These weaknesses include tax and pricing policies on fuels and electrical power and a surfeit of environmental standards and controls, many of which have paralyzed the energy industry on a project-to-project basis. Short-term options include economic incentives for the oil industry to develop offshore drilling programs and the extensive oil shale in the western U. S. In addition, environmental standards can be relaxed in areas where clean-up strategies have little payoff in terms of improved health. Domestic gas can be allocated to the dirtiest sources, and costs for environment cleanup can be internalized by varying prices. Stack gas and fuel-cleaning processes, along with more optimum allocation of available clean fuels and more uniform national environmental standards, can be used over the next 5-8 years until coal and fuel oil conversion processes are perfected. Over the long term, these conversion processes could be used to make hydrogen fuel which could then be used in a hydrogen economy to feed fuel cells for local power distribution and for transportation vehicles. In the nuclear energy area, much more emphasis must be put on high-temperature gas-cooled reactors, gas-cooled fast-reactors, heavy-water reactors, and molten-salt breeder reactors.

1971

29890 **APTIC NO. 52243**

Davis, Karl Gerdner, Terrance Beckwith Harris, and John Joseph Collins

REMOVAL OF HYDROGEN SULFIDE AND CARBON DIOXIDE FROM NATURAL GAS. *(Reinigung von saurem Erdgas). Text in German. (Union Carbide Corp., New York) W. Ger. Pat. Appl. 2,162,652. 18p., Dec. 17, 1971. (3 claims).*

The amount of cleansing gas needed for the regeneration of a zeolite adsorbent (used in the removal of hydrogen sulfide and carbon dioxide from acidic natural gas containing 1-30,000 ppm hydrogen sulfide and less than 400 ppm water) was minimized by passing a 200 deg hot natural gas through the inactive zeolite bed, reheating and recycling the escaping gas until the output end of the zeolite bed was heated to 200 degrees. The bed was then purged with 0.1-205 kg mole cleansing gas per 100 kg adsorbent, cooling the escaping gas and recycling it until the output end of the zeolite bed was cooled to less than 100 deg.

29891 **APTIC NO. 51727**

Gupta, S. D. and N. V. Iyer

EVAPORATIVE EMISSIONS FROM GASOLINE-POWERED VEHICLES POLLUTE THE ENVIRONMENT AND WEIGH HEAVILY ON THE COUNTRY S ECONOMY. *Chem. Age India, 22(7):121-124, July 1971. 9 refs.*

The population of different types of gasoline powered vehicles actually in use in India in the beginning of 1968 and the anticipated pollution up to the beginning of 1975 are tabulated. The vehicles include motor cycles, scooters, autorickshaws, buses, large trucks, cars, jeeps, small trucks, and miscellaneous. The average daily vehicle usage has been calculated from the annual motor gasoline consumption and the vehicle population in terms of equivalent cars in 1968. The loss of gasoline due to evaporation from the tank of a Fiat test car (11,000 Sedan, 1966) was experimentally determined. Results show that an average Indian car loses about 20 kg of gasoline/yr due to evaporation from the tank and the carburetor. In 1975, the gasoline powered vehicles in India will be pumping 25,000 tons of gasoline into the atmosphere resulting in pollution of the environment. Costs are cited.

29892 **APTIC NO. 52012**

Phillips, John, Jr.

ENVIRONMENTAL HEALTH. A PARADOX OF PROGRESS. *Dubuque, Iowa, Wm. C. Brown Co. Publishers, 1971, 71p. 40 refs.*

An up-to-date realistic discussion of currently significant health topics is given. Exploration of ideas, development of concepts, identifying value judgements, and critical decision making, are discussed. The natural pollutants such as pollen grains, dust particles, and carbon dioxide; the greenhouse effect; and CO2 and the physiology of living organisms are discussed. Man-made pollutants from gasoline-powered vehicles are described. The auto combustion problems are presented. Overpopulation the ecosystem, water pollution, noise pollution, radiation, and pesticides are also discussed. (Air pollution discussed on p. 17-28.)

29893 **APTIC NO. 52377**

Smith, W. Mac, Jr. and Joe O. Ledbetter

HAZARDS FROM FIRES INVOLVING ORGANOPHOSPHORUS INSECTICIDES. *Am. Ind. Hyg. Assoc. J., 32(7):468-474, July 1971. 9 refs. (Presented at Aspects of Air Pollution Control, Ruston, La., Oct. 1970.)*

An investigation was undertaken to define the toxic hazards of fires involving organophosphorus insecticides. Malathion and parathion solutions in a variety of solvents were burned, and the fire gases and residues were analyzed by gas chromatography. From 90-99% of the malathion and 85-98% of the parathion were decomposed before evaporating, depending on the solvent. Over 90% of the evaporating insecticide was destroyed by flames, and distilled vapors of insecticides escaping the fire were considerably diluted. The amount of insecticide distilled was heavily dependent on whether the boiling point of the solvent was below or above the decomposition temperature of the insecticide. A malathion polymer was formed in burning residue when solvents with a boiling point higher than 150 C were used. Malathion concentrations in fire gases were less than 10 micrograms/cu m. A method for estimating the toxic hazards of pesticide fires is given.

1969

29894 **APTIC NO. 51915**

Bers, Naum Saia

EXPERIMENTAL RESEARCH STUDY CONCERNING THE DEPENDENCE OF HARMFUL EMISSIONS IN AUTOMOBILES EXHAUST ON DRIVING PROFILES AND VEHICLES CHARACTERISTICS. *California Univ., Los Angeles, Dept. of Engineering, Thesis (Ph.D.), Ann Arbor, Univ. Microfilms, Inc., 1969, 114p. 40 refs.*

A linear theory of relations between the operation of an internal combustion engine and the production of harmful exhaust emissions is presented. Results of this study are based on experimental data obtained for automobile road-run parameter replications, laboratory driving simulations, and sampled data investigations. The experimental facility which was developed for this study comprised a specially instrumented test vehicle, exhaust gas analyzers, an electrically-programmed chassis dynamometer, and numerous system parameter recorders and controllers. Sampled data obtained for continuous records of laboratory tests were studied in both time and frequency domains, using Fourier transforms and power spectral density analyses. Their interdependence was modeled through first order transfer functions with associated transportation lags. Pertinent transfer function parameters were computed using estimation criteria of covariance function maximization and least-square minimization. The study brought out the significance of large variations in emission concentrations between two special driving modes, and culminated with computations of an associated set of indices for evaluating the effectiveness of various automobile accessories or engine redesigns. Though results obtained in this study were in the framework of a simplified linear theory, it was felt that the essential relations which influence the concentrations of harmful exhaust emissions were retained. (Author abstract)

CONTROL METHODS

1973

29895 **APTIC NO. 51799**

CATALYSTS. *Autocar, 138(4004):4-7, Feb. 22, 1973.*

General Motors plans to install catalytic converters to reduce air pollution emissions from a limited number of passenger cars in 1973, expects to expand their use in 1974, and expects to be in full production in 1975 models. Ford Motor Co. also announced catalytic converters will be fitted to some of their 1974 cars. To slash the internal combustion engine's exhaust emissions to EPA standards, catalysts are used to accelerate the oxidation and/or reduction of the offending gases. General Motors has evaluated 800 different catalysts on both pellet and morolithic substrates. Platinum was the most likely to succeed as an accelerator of the oxidation of hydrocarbon and carbon monoxide in car exhausts. Four catalysts systems such as single-bed oxidizing, single-bed reducing, single-bed oxidizing and reducing, and dual-bed oxidizing and reducing are discussed. General Motors is also pressing the oil companies hard to reduce the levels of lead and other contaminants in fuels.

29896 **APTIC NO. 51812**

SULFUR DIOXIDE REMOVAL: PART 2. A PLETHORA OF PROCESS OPTIONS OPEN TO ELECTRICAL PRODUCERS. *Can. Petrol., 14(3):38-41, March 1973.*

Various sulfur dioxide-removal processes are discussed. Scrubbing methods such as lime/limestone scrubbing, water scrubbing, manganese ion processes, the basic aluminum sulfate process, the wet thiogen process, alkaline sulfite absorption, and zinc, manganese and magnesium oxide processes are reviewed. The use of a partially neutralized solution of citric acid to absorb cleaned and cooled gas laden with SO2 is mentioned. The pregnant solution is then recanted with hydrogen sulfide to form elemental sulfur and the citrate absorbent is recycled. The H2S is derived from the elemental sulfur. It is estimated that about 90-95% of the SO2 in utility stack gases will be removed. The molten carbonate method is also mentioned.

29897 **APTIC NO. 51826**

Hauptverband der gewerblichen Berufsgenossenschaften e.V., Bonn (West Germany), Staubforschungsinst.

REQUIREMENTS CONCERNING THE EFFICIENCY OF EQUIPMENT FOR THE COLLECTION OF TOXIC DUSTS WITH RETURN OF THE CLEANED AIR INTO WORK ROOMS: DUST COLLECTORS - INDUSTRIAL VACUUM CLEANERS - SWEEPERS. *(Anforderungen an die Wirksamkeit von Einrichtungen zum Abscheiden gesundheitsgefaehrlicher Staeube mit Rueckfuehrung der Reinluft in die Arbeitsraeume: - Entstauber - Industriestaubsauger - Kehrsaug - maschinen). Text in German. Staub, Reinhaltung Luft, 33(6):237-238, June 1973. 4 refs.*

The collection efficiency of the filter material used in small dust collectors, industrial vacuum cleaners, and sweepers must be so high that passage of fibrous and toxic dusts whose maximum allowable working place concentration is higher than 0.1 mg/cu m is less than 1% and of hazardous dust whose maximum allowable working place concentration is below 0.1 mg/cu m is less than 0.5%. Passage is defined as the arithmetic mean of individual dust passage of six different air samples passing the same filter. For small dust collectors, the returned cleaned air flow may not be larger than 10% of the volume of fresh air. All filters for dust collection must be equipped with a manual or automatic rapping device which cleans the filter in intervals to guarantee that a certain throughput volume never drops to below 20% of the value. The specific load of filtering dust collectors may not exceed a value of 0.033 cu m/sq msec. For wet collectors, the specific quantity of scrubbing fluid entered into the contact zone shall not be less than 0.6 to 0.8 l/cu m. For sweepers, the requirements demand that no dust is agitated. The use of lateral brushes without additional dust exhausters is inadmissible. The underpressure in the brush chamber shall never drop below 5 kg of force/sq m at nominal revolution of the brush.

29898 **APTIC NO. 51894**

Ministry of International Trade and Industry, Tokyo (Japan), Dept. of Utilities

A SUMMARY OF EXPERT COMMITTEE REPORT ON NITROGEN OXIDES CONTROL. *(Chisso sankabutsu taisaku kento iinkai hokoku no gaiyo). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(3):83-90, 1973.*

The reduction of nitrogen oxides emitted by power plant boilers is discussed in terms of modification of the combustion process, lowering the nitrogen content in fuels, and removing NOx from exhaust gas. Two-stage combustion, mixed combustion of exhaust gas, and modification of boiler design can be used to reduce NOx. Removal of NOx from boilers is still in the basic research stage.

29899 **APTIC NO. 51895**

Japan Environmental Agency, Bureau of Air Quality

INVESTIGATION ON DISTRIBUTION OF NITROGEN OXIDES. *(Chisso sankabutsu no bunpu gentaiyo ni kansuru kenkyu chosa). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(3):3-46, May 1973. 144 refs.*

Nitrogen oxide removal techniques, emission sources, and concentrations in the air above Japan are discussed. The occurrence of NOx in combustion and industrial processes and the difference in the mechanisms are described. The effects of combustion temperature, oxygen concentration, combustion chamber, and fuels on NOx are mentioned. Nitrogen oxides can be removed by catalytic reduction, adsorption, and absorption. Removal techniques for NOx emitted by boilers, cars, and chemical processes are discussed technically and economically. Future removal possibilities are summarized for boiler, industrial furnace, gasoline engine, diesel engine, nitric acid production, and other industrial process emissions. Emission standards should be determined in view of both toxicity and cost.

29900 **APTIC NO. 51952**

USUTU'S COVERED STOCKPILE COMBATS POLLUTION. *Coal Gold and Base Materials of S. Africa, 20(12):43-44, Feb. 1973.*

Coal dust emanating from mine stockpiles constitutes a definite health hazards; furthermore, the dust contains sulfur which, on oxidation, forms acid and promotes corrosion of the steel structures of surface installations. These problems are eliminated by a conical stockpile cover made up of a three-meter diameter angle iron ring at the top, a circular reinforced concrete ring at the bottom, and supporting trusses spaced out at regular intervals. The angle iron ring, which is mounted on the conveyor structure, is rigid as a precaution against inward collapse. The bottom ring braces the trusses to prevent the cone collapsing inward, while the trusses are designed to carry the weight of the covering and to withstand outside wind pressure. Signals from tilt switches inside the cover provide visual indications of the actual level of stockpile tonnage.

29901 **APTIC NO. 52159**

Sulfur Oxide Control Technology Assessment Panel

PROJECTED UTILIZATION OF STACK GAS CLEANING SYSTEMS BY STEAM-ELECTRIC PLANTS. (FINAL REPORT). *Federal Interagency Committee Evaluation of State Air Implementation Plans, Environmental Protection Agency APTD-1569, 97p., April 15, 1973.*

NTIS: PB 221356

Factors that must be considered in estimating the utilization of stack gas cleaning systems by the utility industry include technology, cost, adverse environmental effects, institutional barriers, and the ability of suppliers to produce and install the systems. These factors were evaluated for seven flue gas desulfurization systems: wet lime/limestone scrubbing; magnesium oxide scrubbing; catalytic oxidation (Cat-Ox); sodium base scrubbing with regeneration (Wellman-Lord process); double alkali systems; and dry limestone injection. Data for the study were obtained from government agencies, representative utilities and suppliers, and on-site visits to installations in Japan and the U. S. The present status of each system is discussed, and forecasts for the applications of the systems are presented for the period 1975-1980. Specific cost examples are given for throwaway and recovery systems, and cost and performance comparisons are made between flue gas desulfurization systems and low-sulfur fuel. Measures for acclerating the rate of utilization of the various desulfurization systems are summarized. In Japan, a Chemico limestone scrubbing unit has exhibited essentially trouble-free operation, with sulfur dioxide removal efficiencies of 80-90%, since March 1972. A Wellman-Lord scrubbing unit, in operation since June 1971, has an average removal efficiency of 90%. In the U. S., Combustion Engineering limestone injection/wet scrubbing systems have exhibited removal rates of 60-80% in long-term tests. Short-term testing of the Babcock and Wilcox wet limestone scrubber and a wet magnesium oxide scrubber has revealed efficiencies of 75-85% and 90%, respectively. The average incremental capital cost of a stack gas scrubbing installation for new generating plants is expected to be about $40/kw. Capital costs for retrofit installations to existing plants will average $45-65. Mean annual costs will be about 2.0 mills/kw/hr.

29902 **APTIC NO. 52327**

ACTIVE CARBON. *(Kasseitan). Text in Japanese. Kagaku Kogyo (Tokyo), 24(8):1077-1080, Aug. 1973.*

Activated carbon consists of powdered and granular types. It can be used in refining gases, recovering solvents, air cleaning, water and air pollution control, and as a catalyst. Activated carbon production, consumption trends, manufacturers, and applications are mentioned. Activated carbon can be used to desulfurize stack gases.

29903 **APTIC NO. 52133**

Adachi, Yoshihiro

ESTABLISHMENT OF EXHAUST SMOKE-DESULFURIZATION EQUIPMENT AND ITS FUTURE DIRECTION. *(Haien datsuryu sochi no secchi jokyo to kongo no hoko). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(5):53-58, April 1973.*

The future of exhaust smoke desulfurization equipment is discussed. Since the consumption of heavy oil is expected to increase at a rate of 12%/yr, stack gas desulfurization methods will become more important in the future. Low-sulfur fuel quantity is limited and gasification methods have not been developed as quickly as hoped. Use of stack gas desulfurization methods is expected to increase by 1973 to nine times that of 1970.

29904 **APTIC NO. 52150**

Aitken, W. R. O. and M. J. Sharpe

DESIGN AND CONSTRUCTION OF IMPROVED SMELTER GAS HANDLING SYSTEM FOR COPPER CLIFF. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, 27p., 1973. 9 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-50.)*

To comply with legislation limiting ground-level sulfur dioxide concentrations, a nickel-copper smelter constructed a new gas-handling system, including a 1250 ft chimney. The extent of the task, the basic design parameters, and significant design and construction elements are outlined. Chimney height required for effective dispersion was determined using the Holland formula for plume rise and the Pasquill-Gifford formula for plume diffusion. The chimney comprises an outer reinforced concrete shell and an inner steel liner, the concrete shell carrying the weight of the 45 ft diameter liner at two support points. At 266 ft, the weight of the liner is transferred to a deep ring girder which is supported by plate girders spanning the chimney tangentially to the liner. Approximately 45 ft of liner below 266 ft is suspended from the girder system. The other support point is the breeching section, which is joined to the ones above and below it by two steel expansion bellows. The weight of the section is carried by spring hangers connected across the upper bellows. The new gas handling system also incorporates 2/3 of a mile of new self-supporting steel flues, and two new electrostatic precipitators are included for improved particulate collection.

29905 **APTIC NO. 52310**

Akitsune, K. and T. Takae

ABATEMENT OF PRILLING TOWER EFFLUENT. *Chem. Eng. Progr., 69(6):73-78, June 1973. 2 refs.*

Control methods for the abatement of urea dust emissions from prilling towers are examined. A new system combining a spray scrubber with a filter was developed and tested. The system was characterized by a relatively smaller pressure drop and higher efficiency than the conventional dust collectors. Applied at a urea prilling tower handling over 500,000 standard cu m/hr of air, the system achieved an overall collection efficiency of 98% and a pressure drop of 40 mm H2O. The recovered urea was sent back to the process as a 15-30% solution. The design and operating variables are reviewed.

29906 **APTIC NO. 51733**

Albertson, Uno and Stig Berkvist

NEW ENVIRONMENTAL CONTROL TECHNIQUES AT THE ASPA MILL. *Paper Trade J., 157(14):24-25, April 2, 1973.*

Pollution control techniques at a new kraft pulp mill are reviewed. The special pollution control features include: oxygen bleaching in a completely closed liquor system, a nearly closed filtrate system for the rest of the bleach plant, collection of temporary discharges and treatment of contaminated condensates. With these measures it is estimated that total BOD discharge will be reduced by 75% to about 35 lbs/metric ton. Lignin discharge will be reduced by 50%. Primary and secondary screening at the new plant is described, and ozygen bleaching, final bleaching and the treatment of condensate is reviewed. Odorous gases from the digester will be burned in the lime kiln. The vent gases from the evaporation plant and from the tall oil will be absorbed in a white liquor scrubber. Emissions of hydrogen sulfide and sulfur dioxide from the recovery furnace will be kept at a low level by: even and well controlled conditions in the furnace; over-sized equipment (the furnace, the air system and the flue gas system); keeping total solids of the black liquor at a high constant level. Dust emission will be low because large precipitators are being installed.

29907 **APTIC NO. 52226**

Albertsson, Uno and Stig Bergkvist

APPLICATION OF NEW ENVIRONMENTAL TECHNIQUES AT THE MUNKSJO ASPA MILL. *Preprint, Technical Assoc. of the Pulp and Paper Industry New York, 21p., 1973. (Presented at the Technical Association of the Pulp and Paper Industry, Annual Meeting, Chicago, Ill., March 5-7, 1973.)*

Environmental protection measures planned by a Swedish bleached Kraft mill are described. By introducing oxygen bleaching in a completely closed liquor system, collecting temporary discharges and treating evaporation condensates in stripper columns, total biological oxygen demand discharge will be reduced by 75% (i.e., from 145 to 35 lbs) and lignin discharge by 50%. Odorous gases from a continuous digester will be burned in a lime kiln, while vent gases from the evaporation plant and tall oil will be absorbed in a white liquor scrubber. Hydrogen sulfide and sulfur dioxide emissions from the soda recovery furnace will be kept at a low level by even and well-controlled conditions in the furnace, oversized equipment (i.e., furnace, air system, and flue gas system), and keeping total solids in the black liquor at a high and constant level. Dust emissions will be controlled by large electrostatic precipitators.

29908 **APTIC NO. 52108**

Atkinson, C. D.

THE PITTSBURGH AND MIDWAY COAL MINING COMPANY SOLVENT REFINED COAL PROCESS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 23p., 1973. 10 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-F-46.)*

The six primary steps of the solvent refined coal process are discussed. These include coal preparation, dissolution, mineral separation, mineral residue processing, solvent recovery, and solvent refined coal recovery. Some of the promising by-products of the process are described. The cost of producing solvent refined coal is discussed along with the advantages of solvent refined coal over other low-sulfur fuels or stack gas treating processes in combating stack gas emissions. The solvent refined coal process can help to relieve the current shortage of low sulfur fuel for power plants and industrial use. The fuel from the process appears to be economically more attractive than other methods of alleviating the present problem of sulfur dioxide and particulate pollution from power plants. From a practical standpoint, the only positive way to prevent SO2 and particulate is to remove the ash and sulfur prior to combustion.

29909 **APTIC NO. 52184**

Azuma, Takekuni

DEODORIZATION BY OZONE. *(Ozon ni yoru dasshu). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(5):328-335, 1973. 10 refs.*

The principals of deodorization of bad odors by ozone are explained chemically, and ozone producers and deodorizers are discussed with diagrams. Ozone oxidizes bad odor chemical elements and neutralizes them. The oxidation decomposition action is enhanced by the presence of steam. Organic matters react at a high speed and inorganic compounds react quantitatively and momentarily. Generally the reaction is greater for compounds with small small molecular weights than for compounds of mercaptans and amines. Bad odor emission sources are rarely single, and the compound odors require pretreatment or post-treatment in addition to ozone oxidation. Usually it is combined with a water scrubber. Generally, the quantity of ozone required for odor oxidation is small, and the contact time is more than 5 sec and no more than 15 sec. In an ordinary sewage exhaust, less than 1 ppm of ozone is added. For a fishmeal treatment plant, the exhaust is scrubbed in a venturi scrubber and 10 ppm ozone is added. When the plant is in full operation, 20 ppm of ozone is desirable, and post treatment by water scrubbing is also desirable for elimination of excess ozone. With a Kraft pulping plant, when 160 ppm of ozone was added, the odor elements decomposed in 2.4 sec. But when ozone concentration and odor concentration were approximately the same, deodorization reaction was not completed, and after 6 sec, close to 30 ppm of methyl disulfide and ozone remained. In such cases, excess ozone should be added and, after complete deodorization, the excess should be eliminated by a scrubber containing activated carbon or a reduction agent. The results of various experiments are presented.

29910 **APTIC NO. 52413**

Bach, Stanislaw, Wojciech Kalczynski, Marian Sokol, Henryk Szwed, and Adam Troszok

MECHANICAL-ELECTRIC DUST COLLECTOR. RESULTS OF INVESTIGATIONS. *(Odpylacz mechaniczno-elektrostatyczny. Wyniki radan). Text in Polish. Zesz. Nauk. Akad. Gorn.-Hutn. Stanislawa Staszica, 47(400):183-188, 1973. 2 refs.*

A mechanical electrostatic dust collector combining in series a vortex-type collector with a horizontal electrofilter was tested at a steel plant on sintering exhaust gases. The collector was designed to allow selection of the electric field. Exhaust gas flow rate was increased to 2-35 m/sec without affecting the dust collection efficiency of approximately 99%.

29911 **APTIC NO. 51845**

Behrens, D.

ENVIRONMENTAL PROTECTION: A CHALLENGE FOR CHEMICAL ENGINEERING. *Chem. Engr. (London), 9(271):143-150, March 1973. 4 refs. (Presented at Europe - The Differences, Symposium of the Midlands Branch, Birmingham, England, April 18-19, 1972.)*

The amounts of major air and water pollutants and solid waste generated by the main sectors of West German Industry in 1969/1970 are shown. Specific tasks for the chemical engineer in the field of air pollution include large-scale testing of flue gas and fuel oil desulfurization problems and the development of processes, such as sorption, ozonization, and ultraviolet irradiation for control of malodorous substances. Other effluent gas problems are thermal catalytic combustion of large effluent gas flows, purification of gases containing hydrogen fluoride from aluminum smelters and ceramic works, as well as the disposal of nitrogen oxides from combustion engine exhausts. Effective effluent control will require removal of traces of heavy metals and treatment of substances resistant to biological degradation. The chemical engineer can contribute to treatment of municipal rubbish by systems analysis of alternative processing systems and by rendering plastics subject to complete combustion or biological degradation. Protection of the environment must also be considered in the stage of process development. There is yet no feasible method of producing detergents without triphosphates, but alternatives to insecticides are under study, including the use of sterilants, the sexual attraction mechanism, and juvenile hormones. Blending of grafting of more readily macromolecular compounds in synthetic polymers and plasticizers may speed up the biological degradation of plastics.

29912 **APTIC NO. 51796**

Bird, David A. H.

AIRCRAFT ENGINE DEVELOPMENTS. *SAE-Australasia, 33(1):14-17, 20-22, Jan.-Feb. 1973. 10 refs. (Presented at the Society of Automotive Engineers, National Convention, Oct. 21, 1971, Paper 20.)*

The annual growth rate for both passenger and freight traffic is about 14 to 16% and can be forecast to increase to about four times its present value by 1980. The developments in aircraft gas turbine technology are described. The aircraft gas turbine exists in a number of forms, each of which has application in a particular field. Various types of gas turbines are classified. Gas turbines are fairly low down in the air pollution list. The carbon monoxide emission from a turbo-fan of medium range transport would be about 1/8th that of the average car engine without emission control. The emission of nitrogen oxides is about 0.3% by weight, or less than 1/20th that of an average car. Development of hypersonic transport is also discussed.

29913 **APTIC NO. 51989**

Bitler, John A. and L. John Minnick

LIME-SULFUR DIOXIDE SCRUBBING SYSTEM AND TECHNOLOGY FOR UTILIZATION OF UNDERFLOW

SLUDGE. Ind. Wastes, 19(2):34-36, March/April, 1973. (Presented at the National Lime Association, Annual Convention, 70th, Hot Spring, Va., May 3, 1972.)

A joint effort to utilize waste resulting from the treatment of gas effluents from a lead smelting operation resulted in a way to control air and water pollution in the battery industry. Tests which were made in conjunction with the plant operation gave satisfactory reduction in sulfur dioxide levels, and initial investigations for the safe disposal of the byproduct waste material were also encouraging, particularly with respect to the low leaching characteristics developed in the final compositions. By incorporating pulverized coal fly ash with the sulfite-sulfate residue from the treatment processes, compositions have been prepared which permit incorporation of broken battery cases into a sanitary structural landfill. (Author abstract modified)

29914 **APTIC NO. 51974**

Busch, J. S.

DESIGN AND COST OF HIGH ENERGY SCRUBBERS. PART III. THE INTERNAL GAS COOLER. *Pollut. Eng., 5(3):34-35, March 1973.*

The integral gas cooler installed within the housing of the separator consists of a water spray counter-current to the scrubbed gas flow, some form of extended gas-water contact surface, and a collection device so that the spray water used for cooling can be collected separately from the used scrubber liquor. In extimating the total cost of installing this type of gas cooler, since the exclusive use of spray trees is generally not acceptable, it is necessary to add the extra cost of some device, such as a bubble cap tray, which is needed for extended gas-liquid contact. Because this extended gas-liquid contact also promotes corrosion, the trays must be constructed of stainless steel. (Author abstract)

29915 **APTIC NO. 52495**

Chassaing, P., E. A. Claria, and F. Sananes

THE C. S. C. SMOKE BLOWER DESIGNED TO IMPROVE THE OPERATIONAL CONDITIONS OF INDUSTRIAL STACKS. *(Presentation du dispositif C. S. C. d amelioration des conditions de fonctionnement des cheminees industrielles). Text in French. Pollut. Atmos. (Paris), 15(57):27-32, Jan.-March 1973.*

A stack device is described designed to provide for improved diffusion of gaseous pollutants emitted by the stack by raising the plume through increase of its kinetic energy, i.e., by increase of the effluent outflow velocity. This can be accomplished either by a central or by an annular jet. The first arrangement works well during lack of wind, but under windy conditions the plume is dissociated from the jet and the effect is nullified. Only the annular arrangement works under all conditions. Air is blown by a blower between the outer surface of the top of the stack and an annular attachment surrounding the top of the stack. The ring of air blown around to escaping flue gases at great velocity initially protects the plume from being immediately bent by the wind, then through turbulence mixing of the air with the effluent gases, dilutes them and increases their flow velocity and thereby the height of the plume. The arrangement was tested experimentally by constructing a sleeve around an experimental stack with the annular spacing varying from 2.5 to 7.5% of the stack diameter; the effect was as described above. Applications include the raising of the smoke plume, avoidance of the smoke plume from being caught up among buildings, improvement of chimney draught, and increased dilution of pollutants.

29916 **APTIC NO. 51874**

Chervyakov, V. A.

AUTOMATIZATION OF ADSORPTION-DESORPTION PROCESSES IN CARBON DISULFIDE RECOVERY INSTALLATIONS. *(Avtomatizatsiya adsorptsionno-desorptsionnykh protsessov ustanovok rekuperatsii serougleroda). Text in Russian. Khim. Volokna, no. 2:55-57, 1973.*

An automatic control system designed for the control of adsorption and desorption processes of carbon disulfide adsorbers in synthetic fiber manufacturing plants with explosion hazards is described. The vent air, preliminarily cleaned from carbon disulfide, is sent to a group of eight to 12 adsorbers filled with activated carbon as adsorbent. The desorption includes such process steps as nitrogen flush, desorption, and drying. The automatic electropneumatic control system features safety interlocks, emergency and warning signalization, and remote control from a control panel. The automatic control system has only pneumatic connections to the adsorber shop where an explosion hazard occurs.

29917 **APTIC NO. 51977**

Coyne, A. E.

DESTRUCTION OF STENTERING FUMES. *Int. Dyer Text. Print., 149(6):316, 18-319, 322, March 16, 1973.*

Pressure has been increasing on dyers and finishers to correct the unpleasant fumes emitted to the atmosphere from stenter ovens with some types of work. The technology available and the corrective equipment are described which has been successfully applied to this problem, where the average obnoxious fume from the stenter oven consists substantially of liberated fiber lubricants used in the knitting process. These oils are extremely condensable and volatile, and can be a nuisance both within and outside the factory confines. They are usually based on long chain fatty acid esters, butyl sterate being a typical example. The collection of the contaminants by a wet scrubbing device and the complete destruction of the contaminants by a combustion device installed in the exhaust line of the stenter oven is discussed. Direct thermal and catalytic techniques and equipment are discussed for the combustion of hydrocarbon emissions from stenter exhaust streams.

29918 **APTIC NO. 52501**

Danilevitch, Yu. I. and V. A. Yurko

DECONTAMINATION OF GASEOUS EFFLUENTS FROM THE PAINT AND VARNISH INDUSTRY. *(Probleme de l epuration des dechets gazeux de la fabrication de peintures et vernis). Text in French. Chim. Peintures, 36(2):53-56, Feb. 1973. 5 refs.*

The bulk of the effluents stem from the sublimation of oil, glycerine, phthalic and maleic anhydrides, synthetic fatty acids, formaldehyde, pentaerythritol, and acrolein. The current procedure consists of washing in a scrubber and precipitation; total degasification is not standard procedure. Losses of phthalic anhydride amount to 6%, those of vegetable oils to more than 2.4%. Quantitatively phthalic anhydride vapors predominate in the reaction gases. To prevent their condensation in the gas duct, the latter has to be heated to at least 160 C. Washing in a scrubber will reduce the content of phthalic anhydride in the waste gas to 0.2 g/cu m at 20 C to which a certain amount in aerosol form has to be added. Thermal purification is based on destructive thermal dissociation of organic molecules and on far-reaching oxidation of the dissociation products. The reaction is exothermic and accelerates itself to completion. Ignition temperature is between 400 and 600 C. Since the content of organic compounds in waste gas is low, gas consumption is high, more than 200 cu m/cu m waste gas. The proposal is advanced to introduce thermal combustion following the scrubbing of waste gases which would include heating in a cyclone and fluid bed heating; this two-step procedure has already been adopted by the paint factories at Lvov and at Riga. Combustion in both places proceeds at 900 C and is 98% effective.

29919 **APTIC NO. 52167**

Debrun, Dominique, Michele Francois, Yves Grillet, and Henri Guerin

ADSORPTION OF SULFUR DIOXIDE ON DIFFERENT MICROPOROUS ADSORBENTS STUDIED BETWEEN 0.00001 AND 760 TORR. *(Adsorption de SO2 entre 0.00001 et 760 Torr sur divers adsorbants microporeux). Text in French. C R Acad. Sci. (Paris), Ser. C, 276(12):971-974, March 1973. 17 refs.*

The physical adsorption of 0-500 micrograms/cu m concentrations of sulfur dioxide on Union Carbide synthetic ceolites type Linde 13 X and 4 A, charcoal, lignite cokes prepared at 900, 1000, and 1200 C, Carling Special metallurgical coke, and hexamethyldisilazane-treated Chromosorb WAW was studied in a pressure range of 0.00001 to 760 torr at 0, 20, and 30 C. The quantity of SO2 adsorbed at O C was largest on Linde 13 X, and lowest for Chromosorb WAW. The adsorption of SO2 at O C took place essentially in pores with radii of 10-30 Angstrom. Linear isothermes were obtained for the adsorption on Carling Special coke of SO2 in a temperature range of 0-20 C and a range of SO2 partial pressures of 0 to 0.00017 torr.

29920 **APTIC NO. 52067**

Dressel, W. M., P. G. Barnard, and M. M. Fine

PREREDUCED PELLETS FROM IRON AND STEEL-MAKING WASTES. *American Inst. of Mining, New York, Society of Mining Engineers, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 12p., 1973. 5 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-B-82.)*

Over 2 million tons of steel furnace dusts are produced each year in the United States. Recycling of these dusts rather than disposal would conserve mineral resources, reduce land requirements for disposal, and decrease pollution. In addition to the iron content, the dusts contain appreciable amounts of zinc and lead. Removal of lead and zinc with simultaneous reduction of iron oxide has been achieved by inert atmosphere roasting of carbon-containing pellets prepared from steel furnace wastes. High and low-carbon wastes were blended to obtain mixtures with sufficient carbon to serve as a reductant during subsequent roasting. The mixtures were pelletized with the addition of bentonite and water, and the dried pellets were roasted in a stream of nitrogen at temperatures ranging from 900 to 1150 C. Zinc and lead contents were reduced to the 0.1% level or less by roasting mixtures containing as little as 7% carbon for 1 hr at 1100 C. Iron metallization increases with available carbon content; 50% metallization is achieved with 7% carbon, 85% metallization with 12.5% carbon, and over 95% metallization when the pelletized mixtures contained in excess of 20% carbon. (Author abstract)

29921 **APTIC NO. 51822**

Epps, J. A., B. M. Gallaway, and R. L. Terrel

POLLUTION: SOURCES AND SOLUTIONS IN BITUMINOUS CONSTRUCTION. *In: Environmental Considerations in Planning, Design, and Construction. Highway Research Board Rept. 138, p. 142-149, 1973. 11 refs.*

A brief summary of possible pollution sources and methods to solve some of the problems are presented. Construction operations using bituminous material can be divided into central-plant mixing, road mixing, seal-coat and surface treatments, prime and tack-coat operations, and certain maintenance operations that use cold-laid mixtures. Asphalt cements are used for control mixing, seal-coat, and surface- treatment operations. Cutbacks and emulsions are used for road mixing, prime coats, and tack-coat operations. Aggregate dust, fly ash, soot, and unburned droplets of fuel oil are the main particulates resulting from asphalt operations. Offensive odors and noxious gases are produced during the fuel combustion process. Noxious gases are most frequently carbon monoxide, sulfur dioxide, nitrogen dioxide, and nitric oxide. Control of pollution can be achieved by use of auxiliary pollution control equipment, new and innovative equipment, and use of special mixtures. Various auxiliary and new equipment are described. A number of hypothetical mixtures that would be satisfactory to control pollution are suggested. Bituminous binder that will coat and mix at relatively low temperatures offers significant advantages. Natural aggregates that can be mixed with little processing to produce desired gradation offer significant advantages.

29922 **APTIC NO. 51981**

Falkenberry, Harold L.

EMISSION CONTROLS - STATUS AT COAL BURNING POWER PLANTS. *Mining Congr. J., 59(5):48-53, May 1973. 12 refs.*

Nationwide, the electric power industry is burning over 300 million tons of coal a year, and the industry s annual consumption for power generation appears certain to increase throughout this decade. The problems in meeting environmental standards for the use of coal as a power plant fuel are discussed. Particulate control achieved with electrostatic precipitators is described. The need to develop better methods for field collecting and measuring the size distribution and quantities of the very fine particulate fractions in stack gases is pointed out. The bulk of the expenditures for research and development and for large scale experimental installations related to use of coal for electric power generation has been directed toward removal of sulfur oxides from stack gases. Catalytic gas-phase oxidation processes and the magnesium oxide scrubbing processes are discussed for removal of sulfur dioxide. Both the catalytic oxidation and the MgO scrubbing processes are designed to recover the sulfur as sulfuric acid. It seems that there are quite restrictive limits on the marketability of by-product sulfuric acid. Recovery of elemental sulfur is very costly. Solvent refining and coal gasification are described as processes to produce clean fuels from coal. At the present time standards are tough to meet with coal as fuel.

29923 **APTIC NO. 51824**

Feller, Kurt W., Max Kamber, and Zbynek Kocian

NEW HEAVY METAL FOUNDRY IN TRIMBACH NEAR OLTEN (SWITZERLAND). *(Neue Schwermetallgiesserei in Trimbach bei Olten (Schweiz)). Text in German. Giesserei (Duesseldorf), 60(13):381-384, 1973.*

Design and construction of a new Swiss heavy metal foundry in Trimbach near Olten is described. About two million dollars were invested in the plant which will produce 700 tons of cast metal/yr. Special attention has been placed on dust cleaning of the waste air. The crucible furnaces are equipped with exhaust hoods which draw off the smoke and pass it to cloth filters which remove the zinc oxide and other particulates. Through drawing off the air from the furnaces, a large amount of heat is drawn off too. The vapor and smoke developing during the casting process is also drawn off by an exhaust hood which is automatically brought into the correct position for catching most of the smoke. Roof ventilators are installed which draw off the residual smoke and heat from the workshop. The sand processing station has been enclosed as tightly as possible. The air drawn off is passed to a venturi scrubber for 600 cu m air/min. Of the total waste air quantity of about 120,000 cu m/hr, about 72,000 cu m/hr leave the foundry cleaned. All machines in the cleaning stations are connected to a cyclone followed by a scrubber. The cyclone as preliminary cleaning facility permits the recovery of metallic dusts.

29924 **APTIC NO. 52122**

Fujisawa, Hideya and Hisanori Kobayashi

GASOLINE INJECTION SYSTEM VIEWED FROM EXHAUST EMISSION CONTROLLING MEASURES.

(Haikigasu taisaku kara mita gasorin funshasochi). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):411-419, April 1973. 8 refs.

The gasoline injection system is viewed with more interest today because it is more advantageous in meeting the very rigid air/fuel ratio control tolerance required of the fuel feed system of the automotive engine for emission control. The gasoline injection system designed for external uniform air/fuel mixtures is discussed. It comes in two types, the intra-cylinder injection type and the intake pipe injection type. It is also classified into the continuous and intermittent injection types. The intra-cylinder injection type features higher compression ratio and developed power. However, the atomized fuel contacts the cylinder wall and locally dilutes the motor oil. Due to this disadvantage, the intra-cylinder injection system is employed only with racing car engines. The intake pipe injection type is more popular, in which importance of fuel atomization is rather secondary. In an experiment, particle size of the atomized fuel produced no different results in the engine performance and exhaust emissions. The intermittent injection type is more advantageous for quantitative control of fuel injection than the continuous type. Fuel distribution function of the injection system is funadmentally different from that of the carburetor. The prerequisite of the injection system is that equal amounts of air and fuel must be supplied to all the cylinders. Three types of mix ratio control systems are available: throttle speed control, speed density control, and mass flow control. Adjustments necessitated by atmospheric pressure and temperature, acceleration and deceleration, and cold and warm starting are discussed. The electronically control injection system is also discussed.

29925 **APTIC NO. 52519**

Ginneken, A. J. J. van

THE SHELL FLUE GAS DESULFURIZATION PROCESS. *(Het Shell-procede voor de ontzwaveling van rookgassen). Text in Dutch. Chem. Tech. (Amsterdam), 28(9):194-196, 1973. 1 ref.*

A process for the desulfurization of flue gases generated by sulfurous fuel combustion processes is described. The sulfur dioxide-containing flue gas, without fly ash and soot particles removed, passes along thin canals coated with copper oxide as an adsorbent for the removal of SO2 on copper oxide by diffusion. The gas temperature is 400 C, at which regeneration with hydrogen is performed in another unit. During regeneration, copper sulfate is reduced to copper, and gaseous SO2 is obtained. Copper is again oxidized to copper oxide for being recycled in the adsorption process, while the resulting SO2 can be concentrated into marketable sulfur compounds or to elementary sulfur by the addition of hydrogen sulfide in the Claus process. The Shell process is suitable for the desulfurization of flue gases with a minute oxygen content and SO2 content below 0.5% by volume. The specific costs of flue gas desulfurization in a thermal power plant firing fuel oil with 3 to 4% sulfur amount to 1% per kWh. A pilot plant in the Shell refinery in Pernis reached an efficiency of 90%, the contact time is 1 hr.

29926 **APTIC NO. 52187**

Gonzalez, J., M. Lira, and E. Vargas

THE PAIPOTE COPPER SMELTER OF THE EMPRESA NACIONAL DE MINERIA. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, 14p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-51.)*

The Paipote Smelter in Atacama province, Chile, produces blister copper from ores and concentrates received, respectively, from small mines and flotation plants. The actual installations were completed in 1970 with the incorporation of three Hoboken siphon-type converters and a sulfuric acid plant. The Hoboken converters have 21 tuyeres with an airtight duct system for removal of sulfurous gases which are treated in the sulfuric acid plant. Gases leave the converters at 1000 C and are cooled in stages by passage through organ pipe-type coolers, a hot electrostatic precipitator, a counter-current weak acid tower, and a tower filled with ceramic rings. In the last tower, steam is condensed and the gas is cooled to 35 C. The gas then goes through a drying tower and a series of counter-current heat exchangers using gas from the catalysis. Catalysis outlet gas is treated in an absorbing tower in which sulfur trioxide is absorbed by counter-current sprinkling with 98% acid. Design capacity of the sulfuric acid plant is 120 tons/day, but permits instantaneous production equivalent to 200 tons/day. Production indexes of Hoboken and Pierce Smith converters are compared, and an expansion program which will increase smelting capacity by 50% is described.

29927 **APTIC NO. 52326**

Goto, Sotoharu, Jun Nakamura, Yuji Abe, and Tadanari Matsuo

MANUFACTURING METHOD OF GAS OXIDATION CATALYST. *(Gasu sankayo shokubai no seizohoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-22591. 4p., July 6, 1973. (Appl. Jan. 31, 1969, 2 claims).*

A low-cost, long-life catalyst which oxidizes automobile exhaust gases is described. The method for manufacturing the catalyst is outlined. The catalyst contains 2-20% chromium oxide and 0.2-5% nickel or cobalt oxide. The carrier consists of a porous material chiefly composed of silica and alumina.

29928 **APTIC NO. 52328**

Goto, Yasukichi

OFFENSIVE ODOR CONTROL TECHNIQUES AND FACILITIES IN MARINE AND LIVESTOCK PRODUCTS PROCESSING. *(Suisan chikusan kako ni okeru akushu bojo gijutsu shisetsu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):371-374, July 1973.*

Fish and livestock products processing, produce offensive odors during drying and condensing operations. Control methods include process changes, closed systems using indirect heating and cooling systems, incineration, and treatment of effluents.

29929 **APTIC NO. 51833**

Graham, J. J. and B. J. Young

COAL TAR NAPHTHALENE UNIONFINING. *Erdoel Kohle (Hamburg), 26(6):331-333, June 1973. 3 refs.*

The catalytic hydrodesulfurization of coal tar naphthalene has been successfully used in five commercial plants. In addition to removing sulfur compounds, hydrotreating reduces or eliminates other impurities such as nitrogen compounds, unsaturates, and metals. The treated naphthalene constitutes an improved phthalic anhydride plant feedstock. Refining, operating, and maintenance costs are low. The versatility of the Unionfining process makes it applicable for the hydrogenation of a wide variety of other chemicals. Freshly distilled naphthalene is mixed with a hydrogen-rich gas and sent to a fired heater. The vaporized mixture passes to a fixed-bed reactor in which it contacts a high activity, non-noble metal catalyst. Typical reaction temperatures are 550 to 800 F, typical reactor pressures are below 500 psig, and liquid hourly space velocities range from 1.5 to 4.0. The low-cost catalyst is readily regenerable with mixtures of air, steam, or other inert gases. In the reactor sulfur compounds are converted to hydrogen sulfide, nitrogen compounds are converted to ammonia, and oxygen compounds are converted to water. Reactor effluent passes through heat exchangers and a cooler to a separator from which hydrogen-rich gas is withdrawn for recycle to the reactor. A portion of this gas must be bled from the unit to remove hydrogen sulfide from the system.

29930 **APTIC NO. 52183**

Haas, L. A. and S. E. Khalafella

CATALYTIC THERMAL DECOMPOSITION OF CARBONYL SULFIDE WITH AND WITHOUT SULFUR DIOXIDE. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, 16p., 1973. 22 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-6.)*

The thermal decomposition of carbonyl sulfide (COS) was studied in an integral reactor with various catalysts. An apparent activation energy of 28.7 kcal/mole was measured for COS decomposition without a catalyst. In the presence of a contact catalyst such as alumina or silica, the apparent activation energy was 5.6 kcal/mole. At temperatures below 635 C, the main decomposition products of COS were carbon dioxide and carbon disulfide. At higher temperatures, the main products were carbon monoxide and sulfur. The quantity of COS reacting increased when a stoichiometric amount of sulfur dioxide was added. Over 90% COS conversion was obtained with chi alumina at 400 C; without added SO2, only 30% COS decomposition occurred at 520 C. The dgreee of interaction of COS and SO2 was greater with pure chi alumina than when transition metals were present. (Author abstract modified)

29931 **APTIC NO. 52424**

Haga, Tatsuro

PROCESS AND DEVICE TO SEPARATE COMBUSTION SOOTS OF CRUDE HEAVY OIL. *(Genjuyu nenshosusu no bunri shori hoho narabini sochi). Text in Japanese. (Toden Fly Ash Kogyo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-17709. 8p., May 31, 1973. (Appl. Nov. 10, 1969, 2 claims).*

Usually, the soot emitted from a heavy oil-burning boiler is treated with ammonia for neutralization of sulfur oxides. This produces a large amount of ammonia sulfate. A new process is described which separates the ammonium sulfate from the remainder of the soot, and then separates metals from the carbon. The mixture is mixed with water and stirred into a slurry containing 30% water. The slurry is then heated, stirred, and added to water. Raw ammonium sulfate is extracted from the slurry. Three sedimentation tanks are used in which ammonium sulfate and carbon are precipitated. The ammonium sulfate solution is taken to a distillation apparatus where crystalline ammonium sulfate is recovered. The carbon is neutralized with calcium carbonate and purified. Nickel, vanadium, and other metals are separated out as ammonium compounds during the water-mixing process.

29932 **APTIC NO. 52325**

Haug, Norbert, Ehrenfried Schuett, and Udo Wiesmann

TRANSIENT BINARY DIFFUSION OF GASES IN POROUS CATALYSTS. PART I: EQUIMOLAR DIFFUSION AND NON-EQUIMOLAR DIFFUSION CAUSED BY WALL EFFECTS IN THE TRANSITION RANGE. *(Instationaere binaere Diffusion von Gasen in poroesen Katalysatoren. Teil 1: Aequimolare und durch Wandeinfluss im Uebergangsbereich verursachte nichtaequilmolare Diffusion). Text in German. Chem.-Ing.-Tech., 45(12):847-854, 1973. 23 refs.*

In some technical processes such as drying, gas cleaning, and ion exchange the diffusion of gases at simultaneous sorption on the inner surface of porous solid bodies determines the velocity. These processes are generally transient. Transient diffusion of two gaseous components in porous catalysts can be described as an elementary model with the aid of Fick s second law, provided that diffusion is equimolar in the transition range as a result of equal molar masses and equal linear adsorption. However, if the molar masses differ then diffusion is not equimolar and the model has to be refined. Thus, the expressions which have only been tested experimentally for the steady state, are used for the transient description, and satisfactory agreement with experimental results is obtained for Knudsen numbers that are not too small. Deviations occur in particular when convective transport can no longer be neglected at low Knudsen numbers, or when additional non-equimolarity is caused by strong adsorption.

29933 **APTIC NO. 52487**

Hazama, Yoshibumi

OFFENSIVE ODOR CONTROL MEASURES IN CHEMICAL/PETROCHEMICAL FACTORIES. *(Kagaku, sekiyukagaku kojo ni okeru akushutaisaku). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):375-381, July 1973. 5 refs.*

Odors emitted by chemical/petrochemical factories can be removed by combustion (incineration), adsorption, scrubbing, or a combination of these techniques. Incineration oxidizes and reduces the odors to water and carbon dioxide. Complete disposal by this method requires 18% or more oxygen, combustion at 650-800 C for 0.3-0.5 sec, and checks on various problems in the heat exchanger. Adsorbents include alumina, bone charcoal, silica gel, magnesia, activated carbon, ion exchange resins, and sulfonated ash. Water soluble gases such as chlorine and ammonia are generally removed by scrubbing. The few water soluble hydrocarbons can also be disposed of by this method. Scrubbing is cheaper but less effective than incineration or adsorption. Deodorization efficiency can be improved by addition of a surface acting agent. A deodorant water solution may be sprayed onto mobile odor sources. A water curtain can be used to prevent odors from liquid leaks in a pipeline from scattering. Process modifications can also eliminate odors.

29934 **APTIC NO. 52349**

Heinrich, Bernhard, Dieter Stockburger, and Peter Thoma

STUDIES FOR REDUCING THE CHANCES OF DUST EXPLOSIONS IN FILTERS. *(Untersuchungen zur Eindaemmung von Staubexplosionen in Filtern). Text in German. Chem.-Ing.-Tech., 45(14):946-950, 1973. 3 refs.*

The danger of dust explosions in filters can be reduced through installing changes in the filter which reduce the explosion pressure and the pressure increase velocity. For determination of the extent to which a dust explosion can be reduced by installations, experiments were carried out. In a first series of experiments the influence of the filter division by sheet steel installations was studied. A pressure resistant 1 cu m container was used. About 75% of the container volume was divided by thin parallelly arranged aluminum sheets of 1 mm thickness. A most efficient explosion pressure reduction was achieved with installations spaced 25 mm apart. In a second series of experiments the influence of filter elements was studied by installation of envelope-type cloth filters between aluminum sheets. The spacing was again 25 mm. The explosion reducing effect of the aluminum sheets was enhanced by the additional installation of envelope-type cloth filters. The explosion pressure was reduced by a factor of four and the pressure increase velocity at least by a factor 12. The experiments also revealed that envelope-type filters are to be preferred over tubular bag filters because a large partial volume is avoided.

29935 **APTIC NO. 52522**

Hess, K. and R. Kotkamp

PHOSGENE DESTRUCTION BY THERMAL REACTION. *(Phosgen-Vernichtung durch thermische Umsetzung). Text in German. Chem.-Ing.-Tech., 45(13):873-881, 1973. 4 refs.*

Use of phosgene as reactant in chemical syntheses leads to process waste gases, and spent air from building and tank ventilation, which are contaminated with phosgene. The waste gases frequently also contain a considerable concentration of carbon monoxide in addition to other chlorinated trace contaminants. It therefore seems reasonable to subject the waste gases and spent air to joint thermal reaction in a combustion chamber, possibly with the addition of auxiliary fuel. Once a system of reaction equations had been set up, equilibrium calculations were performed for a series of technically interesting cases to determine the theoretically attainable exhaust gas compositions by means of a computer program. Since the kinetics of the pertinent reactions was largely unknown, although the design of a technical phosgene elimination plant is primarily affected by kinetic data, experimental studies were performed on adjustment of the equilibrium composition. For this purpose the reaction conditions for complete decomposition of phosgene to below the detection limit were investigated in an experiment combustion chamber that could be fed with phosgene, air, inert gas, and natural gas. The experiments revealed that the normally expected low phosgene concentrations could be destroyed under all circumstances. They were nearly entirely converted to hydrogen chloride. The fuel-to-air ratio plays no major role. No special burner construction is required. A conventional vortex burner can be used. If higher phosgene concentrations must be expected, the maximum possible phosgene quantity must be determined according to which the water vapor concentration is to be selected (1 mol phosgene requires at least 1 mol water vapor). Operation must take place with low air surplus. The combustion chamber must be designed for a residence time of about 0.3 sec for the maximum possible gas volume. A burner must be used which produces a stable flame to which the phosgene-rich waste gas flow is added.

29936 **APTIC NO. 52171**

Hoffman, C. A.

FILTRATION FABRICS FOR DRY DUST COLLECTOR APPLICATIONS IN THE ALUMINUM INDUSTRY. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 365-373, 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum, Engineers, Metallurgical Society, 1973, Paper A73-26.)*

Filtration of gases or vapors through a cloth or fabric inherently provides 99+% particulate collection efficiency. Fabric filters are generally divided into two types: mechanical shakers and reverse air jets. The mechanical shaker type is usually dressed with woven fabric bags, and the dust is collected on the inside of the bags. Cleaning action is by mechanical shakes, and the collector is compartmented to allow continuous operation. The reverse air jet type is usually dressed with nonwoven (felt) fabric, and the dust is collected on the outside of the bag. Cleaning is achieved by a momentary high-pressure jet of air on the inside of the bag which distends the bag and dislodges the dust. Compartmentation is not required for continuous operation. Specific woven and felt fabrics are reviewed for use in bag filters handling emissions from aluminum refining, smelting, and carbon plant operations. Case histories are presented, and the optimum fabric for these collection systems is described. (Author abstract modified)

29937 **APTIC NO. 52476**

Hoffmann, R., H. Kuerten, and O. Nagel

MASS TRANSFER AREA AND HYDRODYNAMICS IN JET AND VENTURI WASHERS. *(Stoffaustauschflaeche und Hydrodynamik in Strahl- bzw. Venturi- Waeschern). Text in German. Chem. Ing.-Tech., 45(13):881-887, 1973. 9 refs.*

The model system of aqueous sodium sulfite solution oxidized by atmospheric oxygen was used in so-called jet and venturi washers of various dimensions in order to find a relationship between the hydrodynamic conditions (mass flow rate of liquid and gas) and the mass transfer area. The experimental results allow uniform correlation with the energy density dissipations. The experimental set-up consisted of the top section with the entrance for gas and liquid, the cylindrical mixing tube, and the separator. The gas/fluid mixture flows through the mixing tube from top to bottom and is separated in the bottom again. The volume flows of gas and fluid, the fluid pressure prior to entry into the nozzle, as well as temperature and pressure on various levels of the mixing tube and in the separator were measured. The mass transfer area was determined by means of a chemical method. It was calculated from the yield of the familiar reaction of a cobalt-catalyzed-sodium-sulfite-solution with oxygen. The results of the tests revealed that the mass transfer area is produced by atomization of the jet, and from gas velocities of 10 m/sec on fluid by droplets thrown out of the turbulent fluid film which travels along the wall. To a much lower extent the mass transfer area is determined by the wet wall area.

29938 **APTIC NO. 52301**

Holland, W. D. and R. E. Conway

THREE MULTI-STAGE STACK SAMPLERS. *Chem. Eng. Progr., 69(6):93-95, June 1973. 9 refs.*

The design and operating variables of three cascade samplers for determining the particulate content of stack gases are examined. The stack samplers have been individually tested on the exhaust gases from oil-fired burners, coal-fired power plants, and kraft recovery furnaces; test results are reviewed.

29939 **APTIC NO. 52212**

Holler, Karl Friedrich

EXPERIENCES WITH INSTALLATION AND OPERATION OF OIL AND GAS-FIRED ROOF-INSTALLED CENTRAL HEATING SYSTEMS. THE ROOF-INSTALLED CENTRAL HEATING SYSTEM OF THE NEW TRACT OF THE HOSPITAL OF THE BORROMEE NUNS IN TREER. *(Erfahrungen in Anlage und Betrieb von oel-und gasgefeuerten Dachheizzentralen. Dachheizzentrale im Neubau des Krankenhauses der Borromaerinnen in Trier). Text in German. Sanit. Heizungstech., 38(6):546-553, 1973.*

The roof-installed central heating system of a hospital tract in Trier comprises a total of five boilers which can be heated either with extra light fuel oil or with gas. The waste gases are discharged through steel chimneys ending 1500 mm above the roof. This height is enough for satisfactory dispersion of the waste gases. Through the operation of the boilers with overpressure, the waste gas leaves the chimneys with a velocity of 10 m/sec. Three of the five boilers are used for producing the required heat for room heating, two of the boilers for producing the heat required by the various utilities. Each of the first three boilers has a capacity of 3.0G cal/hr, each of the two other boilers 1.0G cal/hr. Installation plans and illustrations of the chimneys and the noise attenuators are provided.

29940 **APTIC NO. 51995**

Horowitz, Joel

INSPECTION AND MAINTENANCE FOR REDUCING AUTOMOBILE EMISSIONS, EFFECTIVENESS AND COST. *J. Air Pollution Control Assoc., 23(4):273-276, April 1973*

The Environmental Protection Agency has recently evaluated several inspection and maintenance approaches for in-use vehicles that are potentially applicable to pre-1975 automobiles. The results of this evaluation are described and used to estimate the effectiveness and cost of inspection/maintenance for reducing total automobile emissions through 1985. It is estimated that inspection/maintenance programs for pre-1975 automobiles may be capable of achieving 8 and 10% reductions in total automobile emissions of hydrocarbons and carbon monoxide, respectively, until 1980 and 2-3% reductions in 1985. The need for inspection of automobiles of model year 1975 and later, and the potential applicability of present short-duration inspection procedures to these vehicles, are also discussed. Various emission tests and tune-ups are discussed. (Author abstract modified)

29941 **APTIC NO. 51864**

Hosoya, Tatsuo

TREATMENT TECHNIQUE FOR HARMFUL GAS AND ITS EXAMPLE. *(Yugaigasu no shori gijutsu to sono jissairei). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(2):53-60, Feb. 1973.*

Stack gas cleaning equipment for chemical plants are described. A cleaning tower made of polyvinyl chloride was used to treat chlorine-containing gases. Gas was sampled in the cleaning tower and analyzed by spectrophotometry. In another company, a similar cleaning tower, together with a cooling tower, washing tower, and cycling tower were used to treat hydrogen chloride containing stack gases. The stack gas was sampled in the cleaning tower and analyzed by spectrophotometry.

29942 **APTIC NO. 51734**

Hussey, A. M. W.

DUST COLLECTION IN INDUSTRY. *Filtration Separation (Purley), 10(2):181-182, 184, 186, 188, March/April 1973. (Presented to the Society of Filtration and Separation, Manchester, England, Nov. 7, 1972.)*

Dust collection in industry is reviewed. Four types of dust collection equipment and their applications are described, including: mechanical cyclone collectors, bag filters, wet scrubbers, and electrostatic precipitators. Installation costs for these are considered. Equipment selection data are reviewed, with emphasis on gas flow, solids concentration, particle size distribution, chemical composition of solids, chemical properties of the gas, physical properties of the solids, physical properties of the gas, temperature, and environment.

29943 **APTIC NO. 52357**

Iida, Hirobumi

EXAMPLES OF PRACTICAL APPLICATION OF DIRECT FIRE GAS INCINERATION TYPE DEODORIZATION DEVICE, AND ITS DESIGN POINTS. *(Chokka gasu nensho dasshu sochi no jisshirei to pointo). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):382-387, July 1973. 8 refs.*

Direct fire gas incineration deodorization devices used in a fish bone/intestinal processing factory, an iron foundry, a printing factory, and an ink manufacturing factory are described. The device consists of a burner section, a reaction section,and possibly a heat exchanger. For more effective thermal decomposition of deodorants by incineration, the odors should be fed into the burner so that all the odors may flow through the flame layer formed by the burner firing in the reaction chamber. Operating costs can be reduced to half if 50% of the waste heat is recovered by a heat exchanger. There is no secondary sulfur dioxide pollution, since most odorous sulfur compounds are in low concentrations. Nitrogen oxides emitted by the incineration of ammonia are extremely low. When an odor consisting of 420 ppm NH_3 was treated at 690 C to reduce the NH_3 concentration to 25 ppm, only 167 ppm of NO_x were measured. Operating variables, pre-treatment to remove steam, and safety devices are discussed.

29944 **APTIC NO. 51861**

Iikura, Takuo

INSPECTION SYSTEM FOR POLLUTION-PREVENTION EQUIPMENT AND DUST COLLECTORS. *(Kogai boshi sochi, syujin sochi no kensaseido ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(2):14-20, Feb. 1973.*

An inspection system for pollution control equipment is described which takes into account emission standards. Safety, efficiency, durability, and other factors of the equipment are inspected. Several inspection associations were set up to perform inspections in and around Tokyo and Osaka. Thirty persons man the inspection station in Tokyo, 20 in Osaka. The inspection methods are in accordance with those set up by the Ministry of International Trade and Industry. Inspections are mainly made of dust collectors and drains in paper processing, dyeing, and metal plating industries.

29945 **APTIC NO. 51884**

Iiya, Koichi

THE SELECTION AND MAINTENANCE OF DUST COLLECTORS. *(Shujin sochi no sentei to iji kanri). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(2):21-28, Feb. 1973.*

Centrifugal separators, bag filters, electrostatic dust collectors, and scrubbers are described for collecting dusts. The cyclone cannot collect particles of more than 5 micron in diameter and is generally unsatisfacotry; therefore it is used as a precollector and for special purposes. The scrubber is fairly cheap and has good efficiency, but causes pollution of the waste water. If there is no problem with the treatment of the waste water, the scrubber is better than the cyclone for dust collection. The venturi scrubber compares favorably with bag filters and electrostatic collectors. The electrostatic collector is limited by the electrical resistance of dust. Water spraying can be used to lower dust resistance. Electrostatic dust collectors are expensive, but maintenance is comparatively easy and operation costs are low. The selection of type of filter fabric is important for the bag filter.

29946 **APTIC NO. 52446**

Ikemori, Kikaku

THE CYCLONE COLLECTORS. *(Saikuron no seino hyoka). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(7):37-41, July 1973.*

Cyclone collectors are used to remove large dust particles and for the pretreatment of stack gases which then enter bag filters and electrostatic dust collectors. Proper cyclone design can decrease the cost of electrostatic dust collectors. If cyclones are used as pretreatment equipment for bag filters to clean off collected dust, the life of the bag filter can be prolonged. Cyclones are used to pretreat dust collectors required for 0.005 0.15 g/cu m dust concentrations; thus the dust concentration coming into the subsequent high power dust collector is reduced to 5 g/cu m. Theoretical concepts are discussed for the relationship between the shape of the cyclone, the power characteristic for the dust separation, the loss of pressure, and the efficiency.

29947 **APTIC NO. 52330**

Imamura, Sadao

OFFENSIVE ODOR CONTROL MEASURES USING DIRECT INCINERATION METHOD. *(Chokusetsu nenshoho ni yoru akushu boshi taisaku). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):388-395, July 1973. 9 refs.*

Odors emitted by non-edible oil and fat refining can be disposed of by direct incineration (afterburning) at 650 C or higher for 0.3 sec or longer. Direct incineration is only applicable to organic gases and combustible inorganic gases; most odors and harmful gases come under these categories. The most effective deodorization occurs when the high temperature flame contacts instantly with the odor and when the combustion can be held at a specified temperature for a certain length of time. Operating variables and a commercial incineration device are mentioned.

29948 ***APTIC NO. 51888***

Inaba, Hideya

REMOVAL OF NOX FROM A STATIONARY INCINERATOR. (Kotei nensho sochi yori hassei suru NOx no jokyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(6):625-631, June 1973.

A method of removing nitrogen oxides from an incinerator is described. The NOx and sulfur oxides are simultaneously reduced by carbon monoxide. The residual oxygen in the exhaust gas is reacted with the catalyst which impairs the catalyst s activity. Water in the exhaust gas causes masking of the catalyst and lower catalyst activity. The catalyst must be improved so that it will not be impaired by O2 or H2O. Sulfur dioxide must be treated beforehand to prevent the formation of carbonyl sulfide. The catalytic reduction must only be performed for nitric oxide and residual oxygen; the concentration of residual O2 must be controlled.

29949 **APTIC NO. 51853**

Ishii, Takeshi, Shigeru Yanagihara, and Eiichi Shinoyama

EXHAUST GAS OF AUTOMOBILE WITH VARIED CO CONCENTRATION AT IDLING. *(Aidoruji CO nodo o kaeta basi no jidosha haiki gasu no sokutei). Text in Japanese. Kikai Gijutsu Kenkyusho Hokoku (Rept. Mech. Eng. Res. Inst.), 27(3):81-103, May 1973. 4 refs.*

Chassis dynamometer tests were conducted to determine the effect of adjusting idle carbon monoxide concentrations on exhaust emissions from a gasoline engine. The tests were based on the four-mode, the seven-mode, and the European-mode cycle tests. The CO concentrations at idling were adjusted to lean (1.5%), standard (3%), and rich (4.5 and 6%) conditions. Exhaust gases were measured by direct and continuous analysis, total bag sampling, and proportional sampling. In all tests, CO and hydrocarbon concentrations were influenced by the adjustments of the carburetor idle port screw, while nitric oxide concentrations were scarcely affected. In the four-mode tests, CO concentration in the idle and deceleration modes was proportional to the adjustment of idle CO concentration. Hydrocarbon emissions showed similar tendencies. In the seven-mode tests, the composite values of CO, HC, and NO appeared to be influenced by the idle CO adjustment, although the effects were not linear. In the European-mode test, CO and HC emissions were definitely influenced by the CO adjustment. The total bag gas sampling method tended to give low CO and HC values in comparison with continuous gas analysis. However, this method is reliable if exhaust gas volume is accurately measured. Improvements are required in the proportional sampling technique, which tended to give the lowest emission values.

29950 **APTIC NO. 52484**

Ito, Norio, Yoshiharu Morita, and Shigekazu Matsuyoshi

DUST COLLECTING DEVICE. *(Shujin sochi). Text in Japanese. (Onoda Cement Co., Ltd., Onoda (Japan)) Japan. Pat. Sho 48-7470. 2p., Feb. 26, 1973. (Appl. Nov. 11, 1969).*

There is a civil engineering technique in which holes are drilled in the soft ground by means of a soil auger, and the holes are filled with lime powder so that the ground may be solidified and reinforced through water absorption by the lime powder as well as through the consequent expansion of the lime. When pouring the lime powder into the holes, however, powder scattering can occur which is detrimental the the health of the workers and nearby residents. A device was designed for complete collection of such powder dust to prevent scattering of the powder at the work site. It is in effect a conical cover with a sliding type center tube. The bottom of the cover is provided with a guide casing which may be inserted into the hole drilled in the ground. Attached to the bottom circumference of the cover is a sealing ring that can be plunged into the ground for sealing when the ground surface is not flat. A dust collector unit is connected to the side of the cover by means of a flexible hose. As the lime powder is poured into the hole through the sliding type center tube, powder dust arises from the pouring of the lime powder. With the dust collector unit, the powder dust is sucked into the dust collector through a flexible hose.

29951 **APTIC NO. 52408**

Kagitani, Tsutomu and Kenji Kaida

DEVELOPMENT OF COMBUSTION CLEANER FEED DEVICE FOR LPG-FUELED TAXI (PASSENGER CAR). *(Takushi LGP (joyosha) ni taisuru nensho jokazai kyokyusochi no kaihatsu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):94-95, Jan. 1973.*

A feed device was designed to supply cleaning agents to a liquefied petroleum gas-fueled car for exhaust gas cleaning and engine performance improvement. The device was tested on an experimental car. The applicability of this device to a gasoline-fueled car has not been tested yet. The feed device is similar to a small carburetor. Secondary air supply is primary and additive agent is secondary during idling or deceleration. The feed device is linked with the accelerator. The additive agent is a liquefied multi-component oxygen compound. The tank contains 15-25 l of the additive which is consumed at a rate of 4-5 l/100 km in the case of a 200 cu cm passenger car. The purification efficiency is 95% for carbon monoxide, 50% for hydrocarbons, and 90% for nitrogen oxides; the average emissions are 0.20-0.50% for CO, 200-400 ppm for HC, and 200-500 ppm for NOx. The engine revolution increases 8-10% and the traction power increases 10-15% at 80 km/hr with this device. The device results in less fuel consumption, improves acceleration performance, and costs 50 dollars/unit.

29952 **APTIC NO. 52444**

Kagitani, Tsutomu

ANTI-POLLUTION ORIENTED NEW COMBUSTION METHODS. *(Mukogai o shikosuru atarashii nenshoho). Text in Japanese. Kikai no Kenkyu (Science of Machine), 25(6):755-760, June 1973.*

The combustion reaction mechanism, the combustion reaction velocity of methane, and photochemical air pollution are discussed. Pollution-free combustion must ensure perfect combustion of fuel and prevention of nitrogen oxidation. It can only be achieved when perfect combustion is assured, even at lower temperatures or under low oxygen concentrations and when nitrogen oxidation is prevented under excessively combustible conditions with high temperature and excess oxygen. Perfect combustion may be achieved by preheating, improved combustion methods, addition of a third component, and improvement of fuel quality. Prolonged combustion time, stratified combustion, and multi-stage combustion help give perfect combustion. The third component such as hydrogen, aldehyde, or alcohol often increases combustion velocity. Addition of steam also acts favorably on combustion. Oxidation of nitrogen can be prevented by avoiding unnecessarily high temperatures. Division of fuel, dilution combustion, and combustion with a heat-absorption reaction can prevent nitrogen oxidation, and thus the formation of nitrogen oxides.

29953 **APTIC NO. 52421**

Kanahara, Motoyasu, Hiroshi Shimomuke, and Tadao Ota

A STUDY MADE FROM THE VIEWPOINT OF EXHAUST GAS CONTROL OF DIRECT INJECTION COMBUSTION CHAMBERS. *(Chokufun nenshoshitsu no haikitaisaku kara mita ichikosatsu). Text in Japanese. Preprint. Japan Society of Mechanical Engineers, Tokyo, 1973. 11 refs. (Presented at the Japan Society of Mechanical Engineers, Annual Meeting, 50th, Tokyo, Japan, April 2-4, 1973.)*

Nitrogen oxides can be reduced through improved dispersion and distribution of the sprayed fuel which improves the fuel combustion in direct injection combustion engines. The combustion chamber of a direct injection engine was redesigned to a shape which gives improved dispersion and distribution of the sprayed fuel. The nitric oxide emissions from normal direct injection, swirl chamber, and gasoline engines were tested and compared to those under different combustion conditions of the atomized fuel oil. Three different combustion chambers (triangular, square, and remodeled square) were tested. Three different fuel spray directions and four swirl ratios were tested with each combustion chamber. The square combustion chamber was the most effective for improving distribution and atomization of the sprayed fuel.

29954 **APTIC NO. 52468**

Kast, W.

PROCESS ENGINEERING APPLIED TO ENVIRONMENTAL PROTECTION. *(Verfahrenstechnik im Umweltschutz). Text in German. VDI (Ver. Deut. Ingr.) Ber., 189:59-71, 1973.*

The questions of the increase of production and consumption with the resultant increase of waste production and of the capacity of natural processes to absorb and recycle this waste are probed. A gross assessment of growth rates can be based on the duplication of energy production every ten years, i.e., on an average annual increase of about 7.2%. Technological possibilities to process practically all wastes are given when economic, energetic, and technological development is kept within certain limits. To such an end all procedures including adsorption, absorption, condensation, rectification, extraction, osmosis, catalytic combustion, and other processes must be employed. The respective expenditures are enormous and are often of the same order of magnitude as investment into production itself. This is acceptable only when recovered materials are recycled and when such procedures are enforced by law. Waste can generally be removed only to a certain degree. If all current waste production was reduced by 50%, this would be of help for the next 10 years or so. But the problem is only postponed because increasing production generates increasing amounts of waste. Therefore all waste must be recycled into the production process which presupposes a selection of materials and preparation of materials which is currently known only in the case of a few metals. Another way out is a change in consumer habits and attitudes, a shift to products with a long life and small waste output. In the future the standard of living will not be determined by the production of energy, soap, oil, and packaging material but by the measure in which this production affects the environment. Various types of control equipment are described.

29955 **APTIC NO. 51892**

Kato, Hisashi

POLLUTION-PREVENTION PROCESS EQUIPMENT AND ITS APPLIED TECHNIQUE. *(Kogai boshi purosesu kiki to sono oyogijutsu ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 3(3):37-44, March 1973. 20 refs.*

Fiber glass reinforced plastics have excellent corrosion and heat resistance; they are often used in pollution control equipment such as scrubbers, ducts, drainage lines, desulfurization systems, fans, and electric dust collectors. The safety and economy of fiber reinforced plastics are discussed. Fiber reinforced plastics can be used in a -60 to -150 C range, and for a short time in the 150-200 C range. The thermal conductivity of these plastics is 0.223 Kcal/m h c, about 1/180th of steel. The plastic can be used in venturi scrubbers, dehumidizing towers, fans, waste incinerator stack, absorption tower, and other equipment.

29956 **APTIC NO. 51994**

Kawashima, Tsuneo

FLUE GAS DESULFURIZATION AND RECLAMATION OF GYPSUM (Haien datsuryu to sekko, kaishuho ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(6):521-536, June 1973.

Flue gas desulfurization with ammonium bisulfite absorption and lime absorption was studied. At a 150,000 cu N/hr capacity NH_4HSO_3 desulfurization plant and a lime desulfurization pilot plant, sulfur oxide removal was tested. In the NH_4HSO_3 process, flue gas is circulated and cooled; it then contacts 30 wt% NH_4HSO_3 in a scrubber. The NH_4HSO_3 is disposed of after sulfur dioxide exposure by precipitation of ammonium sulfate or treatment with calcium hydroxide. In lime desulfurization, the flue gas enters a cooling and washing tower where the flue gas is cooled and diluted sulfuric acid, dust, and sulfur trioxide are removed. Then the absorption solution is processed to recover gypsum (calcium sulfate). The resultant $CaSO_4$ slurry is concentrated and dehydrated by a centrifuge. The absorption efficiency depends of pH and liquid/gas concentration.

29957 **APTIC NO. 51875**

King, J. Gordon

AIR FOR LIVING. *Resp. Care, 18(2):160-164, March-April 1973. 4 refs.*

High Efficiency Particulate Air (HEPA) filters are far superior to electrostatic precipitators for the removal of particulate matter from the air. Electrostatic precipitators are rarely more than 80% effective in terms of particulate removal, and are still less efficient for particles of the size of plant pollens; they require frequent cleaning to maintain the efficiency thye do have, and they produce toxic ozone. In contrast, HEPA filters are 99.97% efficient by particle count at a particle size of 0.3 micron, and become more efficient both above and below this size; they maintain their efficiency without cleaning for 2-5 years; and they do not produce ozone. The HEPA filters have a bed of randomly positioned fibers which provide tortuous passages for air flow. As particles adhere to the fibers, the passages become smaller and efficiency increases. In an experiment designed to compare the performance of a HEPA filter and an electrostatic precipitator under typical home conditions, the HEPA filter was found to be superior with respect to all three of the primary criteria: time required to clean a specific area, ultimate level of cleanliness reached, and durability of filtration efficiency with continued use.

29958 **APTIC NO. 52448**

Kitayama, Zenjiro

STUDY ON SMALL-QUANTITY FUEL INJECTION OF DIESEL ENGINE AND NITROGEN OXIDES. *(Dizeru kikan no shoryo funsha to NOx ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokai Branch, p. 123-126, 1973. 3 refs. (Presented at the Japan Society of Mechanical Engineers, Tokai, Branch Lecture Meeting, 22nd, Nagoya, March 19-20, 1973.)*

Aldehyde emissions from diesel engines increase with the injection timing set to earlier than -40 deg; peroxide emissions increase with injection timing set later than -40 deg. Cylinder temperature is 600 K or lower with the former and higher than 600 K with the latter. This 600 K marks the boundary between low-temperature flame combustion and thermal firing. Nitrogen oxides emissions during low-temperature combustion were studied. With the injection timing set at -50 deg to -10 deg, the smaller the air ratio was, the higher the NOx and peroxide concentrations. The injection timing for the same concentration peak was more delayed with greater Rd. The shifting and distribution of concentration peaks were similar for NOx and peroxide emissions. In the range of 0 to -21 deg, the peroxide and NOx concentrations decreased drastically with more delayed injection timing. Two-stage injection produced favorable results in improving combustion and reducing NOx and peroxide emissions. The timing of the generation of a low-temperature flame is important in combustion improvement; injection timing affects the combustion and exhaust gas composition/concentration the most.

29959 **APTIC NO. 52322**

Knop, Wilhelm

FELTS FOR FILTERS AND TEMPERATURE RESISTANCE. *(Filterfilze und Temperaturbestaendigkeit). Text in German. Wasser Luft Betrieb, 17(7):209-211, 1973. 5 refs.*

Felts with their large pore volume, the high extent of air passage, and the low pressure loss guarantee good collection efficiency. Felts can be loaded with up to 3 cu m dust/sq m/min. Most natural or synthetic fibers can be used which are sufficiently elastic. Felts are strengthened by a mechanical process for which needles are used. Polyester felts resist temperatures up to 150 C, Nomex felts up to 230 C, teflon felts up to 280 C. The latter fiber is rather resistant to acids and bases. Recently metal fiber felts made of stainless steel have come into use which resist temperatures of up to 800 C. Pyrotex T is made of mineral fibers with supporting tissue. It has a temperature resistance of 350 C. It cannot be hydrolyzed not even by superheated water vapor. The supporting structure is also made of mineral fibers wrapped around a metal wire. This felt is particularly suitable for tubular and envelope-type filter bags. Its air passage is 60 to 1501/sq dm/min, its weight is about 1000 g/sq m. The pyrotex T filter is being tested in an aluminum plant, in a foundry, and in plants for the manufacture of highway construction material. Moreover, the Pyrotex T is being tried as a carrier for catalysts.

29960 **APTIC NO. 51755**

Koethe, Klaus and Ludwig Mueller

DETERMINATION OF THE HYDROGEN FLUORIDE PARTIAL PRESSURES. *(Beitrag zur Ermittlung von Flurowasserstoff-Partialdruecken). Text in German. Neue Huette, 18(6):332-336, June 1973. 9 refs.*

The thermal treatment of zinc concentrates by a blasting process is connected with a volatilization of fluorine and arsenic. These pollutants can be romoved from the waste gases by absorption in an aqueous solution. For calculation of the absorber, the vapor pressure equilibria of fluorine-containing systems and the interference by sulfur and arsenic-containing components must be known. A literature survey on the fluoride partial vapor pressures of aqueous fluorine containing systems turned out data for the systems hydrogen fluoride water, HF-fluosilicic acid-sulfuric acid, and H_2SiF_6-H_2. No data concerning the partial pressures for concentrations below 10 g F/l and temperatures between 20 and 60 C, whose knowledge is essential for the absorber calculation, were found. Therefore, the HF partial pressures of binary and ternary systems for concentrations between 0.1 and 10g F/l and temperatures between 20 and 60 C were determined. For the system HF-H_2O, a vapor pressure equation is given. The fluorine concentration in the absorption solution depends solely on the HF partial pressure of the system HF-H_2O. The influence of the compounds H_2SiF_6, H_2SO_4, sulfur dioxide, arsenic trioxide, and arsenic pentoxide is negligible. The fluoride concentrations in the gas cleaned by a wet process are determined by the HF concentration in the absorption solution and by the temperature on the last absorption stage.0

29961 **APTIC NO. 52333**

Kono, Teruhisa and Yasuhiro Fujita

CHARACTERISTICS OF WET TYPE DUST COLLECTION. *(Shisshiki shujin no tokusei). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Kyushu Branch, p. 33-34, 1973. (Presented at the Japan Society of Mechanical Engineers, Kyushu Branch, 4th Meeting, Fukuoka, Japan, March 19, 1973.)*

Six-micron size fly ash mixed with air was fed into an experimental bubble type dust collector. The particles were collected by water due to the inertial collision and the gravitational precipitation. The effect of molecular diffusion can be disregarded. The effects of Reynolds number, bubble shape, inertia, and gravity on dust collection efficiency were studied. Efficiency increased with bubble diameter; however, further increase in bubble diameter lowers efficiency due to longer collision distance and shorter bubble life span. Inertial collision dominates dust collection more than gravitational precipitation.

29962 **APTIC NO. 51863**

Konoki, Keizo and Isao Makino

METHOD FOR REMOVING ACIDIC GAS FROM GASEOUS MIXTURE. *(Gasujo kongobutsu kara sansei gasu no jokyohoho). Text in Japanese. (Toyo Engineering Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-20100. 6p., June 19, 1973. (Appl. March 11, 1969, 1 claim).*

A method for removing acid gases such as carbon dioxide and hydrogen sulfide from stack gases is described. A solvent absorbs these gases and is then regenerated; the acid gases are removed from the solvent by application of the exhaust gas from an ammonia or methanol manufacturing process composed of hydrogen, nitrogen, methane and argon in the case of ammonia manufacturing and composed of H_2, CH_4, N_2, carbon monoxide, and CO_2 in the case of methanol manufacturing. Both exhaust gases have pressures higher than atmospheric pressure. The new method requires much less heating and cooling energy than the conventional method. The new method also uses no air, thus resulting in less equipment cost.

29963 **APTIC NO. 52415**

Kowalski, Wlodzimierz and Henryk Szwed

FLUIDAL DUST COLLECTOR. *(Odpylacz fluidalny). Text in Polish. Zesz. Nauk. Akad. Gorn.-Hutn. Stanislawa Staczica, 47(400):199- 205, 1973. 5 refs.*

A fluid washer-dust collector was tested under industrial conditions to determine applicability, efficiency, and optimum operating variables. The fluid bed washer increased dust collection efficiency with relatively small flow resistance, reduced water consumption, and increased reliability using a self-cleaning bed. Based on tests at a coking plant, collection efficiency was established at 99% with water consumption at 0.4 l/cu nm and a pressure drop of 900 N/sq m.

29964 **APTIC NO. 52445**

Kozima, Yaichi and Yoshisuke Nakamura

DEFLUORIDIZATION AND DESULFURIZATION FROM FLUE GAS IN A TUNNEL KILN IN FIREPROOF BRICK FACTORY. *(Taikarenga kojo ni okeru haien daffutsu datsuryu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(6):621-624, June 1973. 3 refs.*

The cause of withering of grape leaves in Okayama Prefecture was fluoride-containing flue gas emitted by a fireproof brick factory. Several defluoridization/desulfurization processes were tested to find one that could give 99.5% or higher defluoridization efficiency, low water consumption, low fluorine content in the waste water, less sludge, and cheaper running costs. The most suitable process involved absorption of the sulfur oxides and fluorides with sodium hydroxide. Absorbent was recirculated and fluorine and particulates were removed from the absorbent. The process gives 99.6-99.9% defluoridization efficiency and 94-98% desulfurization.

29965 **APTIC NO. 51964**

Kraemer, H.

DESIGN AND GOAL OF BUS CONSTRUCTION. *(Konzeption und Zielsetzung im Omnibusbau). Text in German. Oesterr. Ing. Z., 16(6):189-197, June 1973.*

Four basic types of buses are distinguished, buses for long-distance tours, for public transportation within cities of which there are large and small ones and special buses. The latter group includes a small bus with 15 seats operated with liquid gas. The exhaust gases of this bus contain only carbon dioxide and water. The empty bus weighs 1.75 tons. All other kinds of buses are driven by diesel engines. The buses owned by the Viennese public transportation company can be operated with diesel oil and a propane-butane mixture. Apart from a certain reduction of the fuel consumption, the CO emission is reduced to less than 6 g/HPh and the hydrocarbon and oxides of nitrogen emission to less than 13 g/HPh. This method is no final solution to the exhaust gas problem but a good interim solution for buses already in use. Other studies concerning reduction of pollutant emission involve natural gas which can be carried in 200 atm gauge pressurized bottles or in liquid state.

29966 **APTIC NO. 52191**

Kugovskiy, S. I. and V. G. Stetsenko

EFFECTIVE CLEANING OF VAPOR-DUST EMISSIONS. *(Effektivnaya ochistka paropylevykh vybrosov). Text in Russian. Vodosnabzh. i Sanit. Tekhn., no. 3:25-29, 1973.*

A method and industrial filter for the purification of air containing dust and vapor, as generated in ore dressing plants, is described. The apparatus, in the form of an upright cylinder with 1 m height and 0.8 m diameter, is composed of a rotor designed as a rotary screen, and centrifugal nozzles for water spray. The polluted air, admitted on the bottom side, is forced to pass a ring gap with filter sludge flowing down, and a water spray for coagulation before reaching the filter screen. The particles caught tend to accumulate on the lateral walls of the filter to flow down, which is due to the combined action of aerodynamic and centrifugal forces. At an initial dust concentration of 2.5 g/cu m, the separation efficiency is 98.6%. With a capacity of 1.6 cu m/sec, the water expenditure amounts to 0.1 kg/cu m, and the power consumption is 0.4-0.6 kW/1000 cu m of air. The apparatus has the advantage of minimizing stoppage due to filter clogging.

29967 **APTIC NO. 52479**

Kukin, Ira

ADDITIVES CAN CLEAN UP OIL-FIRED FURNACES. *Environ. Sci. Technol., 7(7):606-610, July 1973. 5 refs.*

The addition of metal-containing additives to improve boiler cleanliness, cut corrosion of firesides and air heaters, and to reduce stack emissions and plumes is discussed. In general, fuel additives should provide boiler cleanliness, high-temperature vanadium corrosion protection, prevention of loss of operating capacity by maintaining design steam temperature, cold end (air heater) corrosin protection, reduction of stack emissions from hydrocarbon particulate matter and sulfur trioxide, and improvement in the handling characteristics of ash in the flue gas in oil fired boilers equipped with precipitators and stack collectors. The significant fuel additives in use today usually contain magnesium oxide (with or without small amounts of aluminum oxide or hydrate), manganese, and magnesium oxide with manganese. The characteristics of each of these additives is discussed, and the efficacy of magnesium oxide additives is compared to that of manganese additives. Handling characteristics and air emissions are also reviewed.

29968 **APTIC NO. 51756**

Lange, Karlheinz

INFLUENCING THE EXHAUST GAS EMISSION OF COMBUSTION ENGINES BY ENGINE MODIFICATION. *(Beeinflussung der Abgasemission von Verbrennungsmotoren durch motorinterne Massnahmen). Text in German. Motortech. Z. (Stuttgart), 34(7):221-225, 1973. 9 refs.*

Through engine modifications, the oxides of nitrogen and hydrocarbon emissions can be reduced but not the carbon monoxide emission. Through high turbulence, fuel and air is mixed intensely which is prerequisite for good combustion. Turbulence can be produced during the intake process or during compression in the combustion chamber. A divided combustion chamber promotes turbulence. High turbulence decreases the thickness of the boundary layer which does not quite burn through. Through this, both the HC and NOx emission are reduced. Installation of narrowings in the combustion chamber influences the HC emission positively if adequately designed, although it actually means an enlargement of the surface. Another control method for the NOx and HC emission is the addition of exhaust gas to the intake mixture. Apart from exhaust gas return, this can be achieved by adequate selection of the control times. Through this the residual gas fraction remaining in the cylinder can be determined. Moreover, late ignition, small electrode gaps, and long spark duration have a positive effect on the exhaust gas composition.

29969 **APTIC NO. 52098**

Law, Charles

PROCESSING PLANTS WORK FOR A CLEANER ENVIRONMENT. PART 2. *Can. Petrol., 14(5):48-49, 51-52, 54, 56-57, May 1973. 1 ref.*

Canadian petroleum refineries are responding to the need to protect the environment from harmful emissions, at substantial cost. The key air pollutants are sulfur oxides, carbon monoxide, hydrocarbons, nitrogen oxides, particulates, aldehydes, ammonia, and other odoriferous gases. Almost all refineries have two-stage Claus plants that convert 92-94% of the sulfur dioxide collected from the refineries into liquid sulfur. Processes involving reduction and extraction can remove almost all the sulfur remaining in the Claus plant tail gas. Unfortunately, the recovery of sulfur is not economical. Minimum sulfur recovery efficiency guidelines are given. Since the major source of sulfur dioxide is the burning of sulfur-containing fuels, the use of low-sulfur fuels can reduce sulfur dioxide emissions to tolerable levels. The main source of hydrocarbon emissions is the evaporation of volatile products from fixed-roof storage tanks; this can be reduced as much as 90% by the use of internal floating covers. Bottom loading of trucks, tank cars, ships, and barges will also reduce hydrocarbon emissions, as will minimizing separator slop recovery, operating separators at as low a temperature as possible, covering the surface of the separators, using smokeless flare tips, and burning the regenerator flue gas in a carbon monoxide boiler. Particulates can be removed by internal cyclones, electrostatic precipitators, and high-efficiency venturis (which also remove liquid and gaseous particulates). The equipment available for nitrogen oxide emission control is still too costly to be worthwhile.

29970 **APTIC NO. 52037**

Lehmann, Peter

APPLICATION OF WUFILON IN THE FILTER INDUSTRY. *(insatz von Wufilon in der Filterindustrie). Text in German. Textiltechnik, 23(2):107-108, Feb. 1973. 1 ref.*

Wufilon filter material made of Dederon fiber for band filters is described. Wufilon filters are suitable for dust separation even from slightly aggressive gases at a flow rate of 1-2.5 m/sec. The pressure losses range from 3 to 10 kp/sq m, the operating resistance is 15 kp/sq m. The dust retention capacities range from 800 to 1000 g/sq m of filter material. The density of the retained dust within the 15 to 30 mm thick filter material increases from the raw to the purified air side, which guarantees high separation efficiency. Such filters are used in the chemical and electronic industries, as well as in ventilation and air conditioning equipment.

29971 **APTIC NO. 52091**

Lewis, Clifford J.

SCRUBBER DESIGN FOR REMOVING SULFUR DIOXIDE FROM OFF GASES OF COAL BURNING POWER PLANTS AND METALLURGICAL SMELTERS *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 15p., 1973. 1 ref. (Presented at the American In-*

stitute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25- March 1, 1973, Paper 73-F-91.)

Design information and operating data on a pilot gas scrubber which is believed to be a new approach for removing noxious gases and particulate matter from the off gases of coal burning power plants and smelters are presented. Sulfur dioxide removal is investigated using the aqueous slurry of lime as the scrubbing medium. The pilot unit was investigated by designing the unit as a horizontal rotating cylinder containing, as one configuration, a suspension of chains and, in another configuration, freely moving objects which cascade as the cylinder is rotated. A scrubber operating on this principal will not plug as the result of the adherence of solid matter within it, and pressure drops will be relatively low. Much additional operating data is needed from a larger prototype unit before the over-all economics and efficacy of a scrubber of this design can be confidently compared with other scrubbers.

29972 **APTIC NO. 52176**

Low, M. J. D. and P. L. Lee

REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. IV: INFRARED STUDY O THE REACTION OF H2S WITH A CALCINED DOLOMITE, CAO, AND MGO. *Water, Air, Soil Pollut., 2(2):75-83, March 1973. 8 refs.*

Many desulfurization processes involve the pickup of hydrogen sulfide by a solid absorbent, but the surface chemistry is not understood. Infrared spectra were recorded of H2S chemisorbed at 25 C by a calcined dolomite, calcium oxide, and magnesium oxide in order to provide information about the nature of the molecular species formed on the solid s surface. The H2S was sorbed even at low pressures, forming a layer of hydroxyls and half-layer sulfide group. Sulfhydryl groups were detected only with MgO. Heating the H2S-treated absorbets in O2 led to the oxidation of the sulfides to sulfites and to sulfates. (Author abstract modified)

29973 **APTIC NO. 52177**

Low, M. J. D., H. Jacobs, and N. Takezawa

REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. III. INFRARED STUDY OF THE SORPTION OF CXHYO MOLECULES ON MGO SURFACES. *Water, Air, Soil Pollut, 2(1):61-73, March 1973. 15 refs.*

Infrared spectra were recorded of volatile CXHyO solvents including methanol, ethyl alcohol, formic acid, acetic acid, ethyl acetate, acetaldehyde, diethyl ether, crotonaldehyde, and crotonic acid adsorbed on magnesium oxide powder at 25 C. In addition to being physically absorbed, all absorbates reacted extensively with the surfaces. The various results show that there was a general trend for the chemisorbed species to form surface carboxylates. The several reactions required the transfer of oxygen from the surface to the adsorbed species, and this removal of the oxygen radical implies a change in the structure of the surface. Extensive reaction would lead to changes in th structure of the surface. The reaction products are water-soluble, so that extensive textural changes would occur if the contaminated solid were water leached. (Author abstract modified)

29974 **APTIC NO. 51814**

Macak, Jiri and Peter Pick

INVESTIGATION OF THE REACTION SYSTEM C(S) PLUS SO2(G). *(Untersuchung des Reaktionssystems C(s) plus SO2(g)). Text in German. Erdoel Kohle (Hamburg), 26(6):345-350, June 1973. 10 refs.*

The reduction of sulfur dioxide with solid carbon by the pulsation reaction chromatography method was studied in a micro reactor. This method was also used for the evaluation of the process and the reactivity of the solid phase depending on the ash content. For the latter investigation, a combination of the thermogravimetric and gas chromatographic analyses was chosen. The synthesis of five model substances of the system C-silica, C-alumina, C-magnesium oxide, C-calcium oxide, and C-ferric oxide made possible the determination of the influence of ash components. The reaction intensity of carbon-containing substances in the reaction with SO2 depends strongly on the ash concentration and quantity. The effect accelerating the reaction speed of the SO2 reduction dropped to zero in the sequence Fe2O3-CaO-MgO-A12O3- SiO2. To an increasing extent C-Fe2O3, CaO-C, and MgO-C systems participate in the reaction through the oxygen transferring function of the oxide. In the experiments, Al2O3 and SiO2 were inert components.

29975 **APTIC NO. 52513**

Mackinger, Herbert

INTEGRAL METHODS FOR THE COMBUSTION OF INDUSTRIAL REFUSE, SLUDGES AND WASTE OIL. *(Integral-Verfahren zur Verbrennung von Industriemuell Schlamm und Altoel). Text in German. Umweltschutz Staedtereinigung (Vienna), 26(6):142-145, 1973.*

A new incinerator has been developed with a three-zone forward stoking grate. Primary air is blown into each zone. The flue gas is returned countercurrent to the waste flow. In the afterburning chamber the combustible components in the waste gas are burned and most of the fly dust is retained. To the standardized incineration, any cooling and cleaning facility can be connected. Cooling of the gases leaving the afterburning chamber with 800 to 1200 C is necessary if the gases are cleaned in electrostatic precipitators. Scrubbers tolerate entrance temperatures of 800 C. The following cooling systems have proved to be suitable: recuperator for cooling preceding the scrubber, for preheating of air which serves as combustion air, and for heating the waste gas leaving the scrubber evaporation cooler; radiation cooler; mixing with cooling air, and waste heat boiler. Both scrubber and electrostatic precipitator reduce the dust concentration below the legally required 150 mg dust/cu m waste gas. The scrubber has the advantage that it also removes some of the gaseous pollutants. In general the emission of gaseous pollutants from incinerators with high combustion temperatures is below the maximum allowable emission concentration.

29976 **APTIC NO. 51823**

Martin, J. E.

PLANT PEAKS SULFUR RECOVERY. *Hydrocarbon Processing, 52(4):135- 137, April 1973. 10 refs. (Presented at the Canadian Natural Gas Processors Association Meeting, Calgary, Alberta, Canada, Nov. 24, 1972.)*

At the Ram River gas- and sulfur-producing plant of the Aquitaine Company of Canada, Ltd., more than 98% recovery of sulfur is obtained from two-stage Claus units and treatment of the Claus tail gas. Each Claus unit includes a reaction furnace and waste heat boiler, two catalytic converters, and three condensers with integral coalescers. More than 66% conversion is achieved in the furnace. Instrumentation that allows maintenance of optimum H2S/SO2 ratios contributes more to the high sulfur recovery than any other factor. The gas plant processes very sour wet gas to produce pipeline quality gas and sulfur, using inlet separation and stabilization, SNPA-DEA gas treating, dew point control, and sulfur recovery stages. A very good balance is achieved between the steam generated by the sulfur plants and the steam required by the amine regeneration units. The entire plant was designed around obtaining the most efficient sulfur recovery.

29977 **APTIC NO. 52004**

Maslan, Frank

RECOVERY OF SULPHUR DIOXIDE FROM WASTE GASES, OZONE PROMOTED LIQUID PHASE OXIDATION. *Can. J. Chem. Eng., 51(2):252-254, April 1973. 16 refs.*

A study of the recovery of sulfur dioxide from waste gases by absorption in sulfuric acid solutions containing manganese sulfate as an oxidation catalyst, and ozone as a catalyst promoter was made. The experiment was designed to make much more concentrated acid (10 to 71%) to observe the recovery at the higher acid concentrations. For a constant air-SO2 rate and constant acid concentration, the rate of absorption of SO2 increased greatly by the addition of ozone. At each acid concentration, the addition of increasing concentration of ozone increased the absorption rate up to a maximum. There is substantial recovery of the SO2 up to an acid concentration of 40% weight. The absorption rate of oxygen in the solution, liquid film controlled, is the principal rate limiting step in the absorption-reduction process. However, the absorption of ozone and of SO2 are also mainly liquid film controlled and do slow down with increasing acid concentration.

29978 **APTIC NO. 52156**

Matsunami, Taizo and Hisashi Kono

APPLICATION OF THE UBE-TYPE (GASIFICATION) DESULFURIZATION PROCESS -- VOLATILIZATION OF HEAVY OIL. *(Ube-shiki gasuka datsuryu purosesu no oyo -- jushitsuyu no keishitsuka). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochemicals), 17(1):107-110, 1973. 2 refs.*

The Ube-type desulfurization process gasifies residual oil with a high sulfur content in a cracking furnace and the product gas is used as a fuel. Residual oil containing 3-4% of sulfur can yield a low-sulfur gas fuel of 0.02% order sulfur content. The caloric value of the gas is 7000-8000 kcal/N cu m. The gasification process was developed at a temperature near 850 C; but it is also possible to produce fuel gas and light oil by heating the material oil at 600 C. The desulfurization system comprises the fluidized bed thermolysis gasification system, the distillation system, the desulfurization system, and the sulfur recovery system. The thermolysis gasification system comprises a high temperature cracking furnace, a normal temperature cracking furnace, and quencher. The formation gas goes through a scrubber, where a traceable amount of sulfur dioxide is completely eliminated, then through an absorption tower where hydrogen sulfide is eliminated, and the refined fuel gas has about 100 ppm of hydrogen sulfide concentration. The separated SO2 and H2S are reacted in the sulfur recovery system, and sulfur is recovered.

29979 **APTIC NO. 52138**

Mayumi, Kazuhisa

ENGINE PERFORMANCE CURVE AND AIR POLLUTION CONTROL. *(Enjinseino kyokusen to kogai taisaku). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(4):420-426, April 1973.*

General explanations of fuel consumption and engine performance curves such as the torque and power curves are given and discussed with relation to exhaust emissions, especially nitrogen oxides. Torque and developed power are related. The torque characteristics of a reciprocating engine are theoretically analyzed: torque is proportional to the product obtained by multiplying the intake efficiency value by the thermal efficiency value of the engine. The developed power can be increased with greater torque to a certain point, beyond which it must be increased by increasing the engine revolution rate unless excess air is supplied to the cylinders. The specific fuel consumption calculation formula is presented. The relationship of the performance curve to carbon monoxide, hydrocarbon, and NOx emissions is discussed. Engine modification measures for control of CO and HC do not directly affect power development performance of the engine; modifications for NOx control cause adverse effects on the engine. Ignition timing modification for NOx reduction results in lower torque and poor specific fuel consumption. The exhaust gas recirculation system, reshaping of the combustion chamber, and change of air/fuel ratio for NOx reduction produce unfavorable effects to power development and/or specific fuel consumption.

29980 **APTIC NO. 51785**

Mills, G. Alex and Harry Perry

FOSSIL FUEL YIELDS POWER+POLLUTION. *Chem. Technol., 3(1):53-63, Jan. 1973. 25 refs. (Presented at the American Chemical Society, Div. of Petroleum Chemistry, New York, N. Y., 1972.)*

Major air pollution sources from fossil fuel power plants are investigated. During conversion to electricity, all fossil fuels produce thermal pollution and emit oxides of nitrogen. The stringent sulfur oxide emission standards have forced electric utilities to substitute low sulfur fuels or to seek ways to continue to use high sulfur fuels and still meet the standards. Lime/limestone scrubbing, magnesium oxide scrubbing, catalytic oxidation, and other processes are described to reduce SOx emissions. Manufacture of synthetic gas and of liquid fuels from coal offers an alternative means of pollution control from fossil fuel plants. The comparative cost per kWh for various cooling methods for abatement of thermal pollution are presented. The cost of dry towers is seven to eight times that of the wet towers. The NOx are produced in all fossil fuel combustion processes with air as an oxidant. The most important combustion modifications to control NOx are low excess air firing, flue gas recirculation, staged combustion, and burner and furnace design changes.

29981 **APTIC NO. 52006**

Mosby, J. F., G. B. Hoekstra, T. A. Kleinhenz, and J. M. Stroka

PILOT PLANT PROVES RESID PROCESS. *Hydrocarbon Process., 52(5):93-97, May 1973. 4 refs. (Presented at the American Petroleum Institute, Division of Refining Meeting, Philadelphia, Pa., May 16, 1973.)*

Numerous resids of widely varying properties have been desulfurized in a proprietary resid ultrafining process. The process gave excellent results in both bench-scale and large pilot plant equipment. Khafji and Gach Saran resids were processed blocked-out during the first six-months of the demonstration run. The results and some orienting cost information are presented. Commerically acceptable cycle lengths can be attained with no problems of catalyst bed plugging. Costs depend strongly upon the feed properties and the desired product sulfur level, but are generally in the range of $0.70 to $1.05 per barrel. A schematic diagram of the process flow of a resid ultrafiner is shown. Investment and desulfurization requirements are about the same for Khafji desulfurized to 1.0 wt% sulfur and for West Texas desulfurized to 0.3 wt% sulfur.

29982 **APTIC NO. 52503**

Muehlberg, E.

DEVELOPMENTS IN THE DECONTAMINATION OF EXHAUST GASES FROM COMBUSTION ENGINE-POWERED VEHICLES. *(Entwicklungen zur Abgasreinigung bei Verbrennungskraftmaschinen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 189:31-57, 1973.*

Progress achieved in the reduction of emissions from internal combustion engines by recycling of exhaust gases to reduce the emission of nitrogen oxides, by exhaust thermal reactors, by afterburners, by catalytic oxidation, by manipulation of ignition timing, by means of specially constructed carburetors, and by direct fuel injection is reviewed. Another research direction includes attempts to develop engines combining the advantages of diesel engines with those of internal combustion engines exemplified by the Hesselman engine, the Texaco engine, and the Franz Meurer engine. Other attempts include improvements on diesel engines. But even if all these developments should be insufficient in the future, the possibility remains to generate hydrogen in a compact gas generator through partial combustion or by endothermic reaction of fuel with water and to feed this hydrogen to any existing engine including the gas turbine. Exhaust gases from hydrogen engines are free of carbon monoxide and of hydrocarbons including polycyclic carcinogenic hydrocarbons, and only nitrogen oxides are emitted. An intermediary step in such a development is the generation by catalytic combustion of a mixture of hydrogen, CO, methane, carbon dioxide, and nitrogen which yields very clean exhaust gas. These and similar solutions also posses the advantage of eliminating particulate emissions with exhaust gases.

29983 **APTIC NO. 52172**

Muhlrad, W. and A. Chauvineau

PECHINEY/PRAT DANIEL DRY PROCESS FOR CONTROL OF FLUORINE COMPOUNDS RELEASED BY ALUMINUM REDUCTION POTS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurigcal Society, p. 209-222, 1973. 8 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-16.)*

A process for controlling fluorine emissions from aluminum reduction pots is based on adsorption of fume by alumina. The pot fume is brough into contact with alumina injected into a venturi tube installed at the bottom of a vertical duct which conveys the alumina/fume mixture to a bag filter unit. The fluorinated alumina is collected and recycled to the venturi tube or the reduction pots. The process configuration operates on a small pressure drop, so energy expenditure is minimal. Process efficiency is directly related to alumina surface area and is 99.5% when the area is more than 20 sq m/g. Operating experience with a commercial unit used to treat fume from 20 pots operating at 130,000 A is discussed.

29984 **APTIC NO. 52047**

Muir, Arthur J.

SONIC GAS COOLING SYSTEMS REDUCE POLLUTION CONTROL COSTS. *Ind. Heating, 40(4):650-652, 654, 656, 658, April 1973. 1 ref.*

Recently developed sonic atomizing nozzles are finding wide use in upgrading gas cooling systems in foundries, smelters, liquid waste incinerators, and various industrial furnaces. The nozzles are self-cleaning, produce droplets from 10-150 micron, and permit a constant quality of atomization over a wide flow modulation range. In addition to cooling hot gases, ultrafine water sprays also condition the gas stream by raising the humidity level to enhance the collection efficiency of pollution control equipment. Computer studies indicate that ultrafine sprays minimize the size requirements of cooling chambers and eliminate the numerous problems associated with the use of excess water. In existing systems, the nozzle control package can be retrofitted to the existing cooling chamber at a cost of approximately $21,000.

29985 **APTIC NO. 52189**

Murphy, J. F.

ALUMINAS IN AIR POLLUTION CONTROL. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 815-841, 1973. 43 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-69.)*

Alumina and alumina-based sorbents, catalysts, and catalyst supports are used in many air pollution control applications because of high surface area, porosity, and thermal stability. Although some air pollution abatement may be used once-through sorbents, problems of solid waste make regeneration attractive, especially where high volume pollutants like sulfur dioxide can be converted to sulfur. Alkalized alumina as a regenerable SO2 sorbent has been tested extensively with some recent reports indicating possible effectiveness on nitrogen oxides as well. High area alumina is used as support for catalytic materials in conversion of SO2 to H2SO4, while special aluminas provide the best catalyst for the Claus process for conversion of sulfuric acid and SO2 to sulfur. The range of available alumina properties of value in air pollution abatement in smelters, power plants, and chemical processing is illustrated by discussing dry sorption of SO2 by alkalized alumina, absorption of SO2 in slurries of basic aluminum sulfate, catalytic conversion of SO2 to H2SO4, and catalytic conversion of SO2/H2S to elemental sulfur in the Claus process. Improved catalysts based on active alumina and the low-temperature version of the Claus process appear to have real value in final clean-up of sulfur compounds in tail gases. (Author abstract modified)

29986 **APTIC NO. 52116**

Nakai, Aishi and Koichi Iinoya

EXPERIMENTAL RESULTS ON PERFORMANCE OF A FIBROUS BED FILTER. *(Aru seniso firuta no seino jikken). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 10(3):156-158, March 1973.*

Two fibrous filter beds 21.2 sq cm in size with thicknesses of 17 and 13 mm made of nylon cloth were tested for collection efficiency and pressure loss. The relationship between the pressure loss of a clean filter and the filtering velocity showed that the pressure loss is proportional to 1.75 to 1.8 powers of the velocity, indicating that the flow is fairly close to a turbulent flow. A comparison of the dust load in terms of the per unit area of material or per unit volume of material revealed that the dust load/volume holds and the influence of the filter thickness is comparatively small.

29987 **APTIC NO. 51946**

Nakasu, Haruo and Yoshifumi Kawakami

HEAT MANAGEMENT AND POLLUTION CONTROL IN SAIJO ELECTRIC POWER PLANT. *(Saijo hatsu-densho no netsu kanri to kogai). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(6):48-56, June 1973.*

Pollution control in the Saijo electric power plant is reviewed. Control methods include low-sulfur fuels, improved combustion process, and heat recovery. Low combustion air combustion is described. High stacks are also used to diffuse the sulfur oxides and other pollutants. Particulates are controlled by an ammonia injection device, an electrostatic precipitator, and an incinerator.

29988 **APTIC NO. 52186**

Niimura, Masayoshi, Tatsuo Konada, and Reishi Kojima

SULFUR RECOVERY FROM GREEN CHARGED REVERBERATORY OFF GAS AT ONAHAMA COPPER SMELTER. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, 27p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-47.)*

A copper smelter installed a new sulfur recovery plant to produce concentrated sulfuric acid by the contact process from the exit gases of a green-charged reverberatory furnace. Conversion efficiency is more than 96% although the sulfur dioxide content of the gas averages 2.5% and can be as low as 1.5%. After treatment in a waste heat boiler and electrostatic precipitator, the reverb off-gas enters the acid plant at 300-350 C. In the acid plant, the gas is first cooled to 67-69 C in a shower cooling tower and further cooled to 37-40 C by a graphite tube-and-shell heat exchanger. The gas then passes through a mist precipitator where impurities are removed. The gas is subsequently cooled to the water-balance temperature limit (18 C when SO2 is 2%) in a second graphite heat exchanger. The surplus moisture is condensed, bleed off, and neutralized with milk of lime. The gas is further cleaned in a second mist precipitator, dried, and introduced into the sulfur trioxide conversion system. The SO3 gas is sent to an absorbing tower to yield 98% concentrated sulfuric acid. The tail gas is neutralized with lime milk to reduce the SO2 concentration to 20 ppm, then passed through a mist precipitator before being vented to the atmosphere. Measures for eliminating formation of white plume and nitrogen oxides are summarized.

29989 **APTIC NO. 52329**

Noso, Shigeyuki

RECENT ELECTRIC DUST COLLECTORS. *(Saikin no denki shujin sochi). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(7):51-63, July 1973.*

High dust collection efficiency is needed to reduce pollution. Therefore, electric dust collectors are being increasingly used. Enlargement of various industries has increased the size of the dust collectors used. Dry and wet electrostatic dust collectors are discussed. Construction and corrosion of the dust collectors are mentioned.

29990 **APTIC NO. 52324**

Nuber, Karl

ACCEPTANCE TESTS IN THE POWER PLANT MEGALOPOLIS. *(Abnahmeversuche im Kraftwerk Megalopolis). Text in German. Energie (Munich), 25(6):154-157, June 1973. 2 refs.*

The power plant Megalopolis in Greece comprises two 125 MW blocks, which were built in the years 1969/70. The first block began operation in June of 1970, the second one in July of the same year. For the soft coal used for combustion with a heating value of 959 kcal/kg, a water concentration of 64%, and an ash concentration of 13%, a special design of the firing system was necessary. The coal is ground and dried with recycled flue gases. A collection system after the coal mill divides the gas-vapor flow. About 2/3 of the flow carrying about 1/3 of the coal quantity go to a cyclone, and after increase of the pressure to an electrostatic precipitator. The pulverized coal with a heating value of about 2130 kcal/kg is injected along with hot air underneath the main burner. A stable flame is obtained which serves for ignition of the remaining 2/3 of the coal which is carried by 1/3 of the gas flow directly from the mill to two burners. In June and July of 1971 acceptance tests were taken. Determination of the waste gas and fly dust losses was difficult because aside from the main stack waste, gas also leaves from the electrostatic precipitator through two minor stacks. In preliminary tests the gas and dust quantities were determined behind the various dust collectors. All gas quantities were determined with Prandtl tubes. The combustible matter in the combustion chamber ash was about 10% and in the fly dust about 1.0 to 1.5%. The gases of the minor stacks contained on the average 150 mg dust/cu m. The dust concentration of the cleaned gas leaving the main stack was considerably below 150 mg/cu m. The carbon monoxide concentrations in the flue gases before entry into the stack were between 0.009 to 0.02.

29991 **APTIC NO. 52418**

Okada, Harukazu

MANUFACTURING METHOD OF COMBUSTION ACCELERATION THAT REMOVES SULFUR DIOXIDE AND ENSURES PERFECT COMBUSTION. *(Aryusangasu o jokyo shi kanzennensho saseru sugureta jonenzai no seizoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-17446. 2p., May 29, 1973. 3 refs. (Appl. June 13, 1968, 1 claim).*

A new fuel additive is described which accelerates combustion of fuel oil and removes sulfur dioxide which forms during combustion, thus minimizing formation and accumulation of carbon. In addition, the additive reduces the fuel s water content to W/O emulsion, thus ensuring near perfect combustion even if the fuel contains considerable water. Two manufacturing methods are described.

29992 **APTIC NO. 52163**

Oppenheim, Rudolf

ASSAY OF A FERRITIC, 13%-CHROMIUM-ALUMINUM-SILICON-TITANIUM STEEL INTENDED FOR USE IN EXHAUST CONTROL DEVICES. *(Untersuchung eines ferritischen 13%-Chrom-Aluminium-Silizium-Titan-Stahles fuer Abgasentgiftungsanlagen). Text in German. DEW (Deut. Edelstahlwerke)-Tech. Ber., 13(1):11-18, April 1973. 7 refs.*

Comparative mechanical tests were carried out to determine the suitability of heat resistant steels for exhaust purification systems of motor vehicles. Among the test steels, a titanium stabilized ferritic 13% chromium steel with 2.3% aluminum, 1.5% silicon, and 0.57-0.62% titanium showed good scaling resistance and excellent scale adherence. In addition, it retained its shape under conditions of severe thermal shock to a remarkable degree. Unlikely to present any particular difficulties either during processing into wide strips with its consistently good mechanical properties, or during forming of sheets or welding, the new steel is now being field tested in exhaust purification systems. The new steel withstands temperatures up to 1050 C either in continuous or intermittent exposure.

29993 **APTIC NO. 52079**

Ota, Shinji and Akio Kiuchi

TWO-STAGE INJECTION TYPE COUNTER-FLOW DUSTOFF DEVICE FOR A FILTER DUST COLLECTOR. *(Rokashujinki ni okeru nidanshiki funshagata gyakusen sochi). Text in Japanese. (Mitsubishi Kakoki Kaisha, Ltd., Tokyo Japan)) Japan. Pat. Sho 48-16952. 3p., May 25, 1973. (Appl. Dec. 26, 1970, 1 claim).*

A bag filter dust removal device featuring two-stage injection is described. Two nozzles inside the filter inject pressurized air in the direction opposite to the normal filtration flow. The frame vibrates with the air pressure which combines to effectively shake off collected dust. The bag filter is described in detail.

29994 **APTIC NO. 51766**

Pearson, M. J.

DEVELOPMENTS IN CLAUS CATALYSTS. *Hydrocarbon Process., 52(2):81-85, Feb. 1973. 18 refs. (Presented at the Canadian Natural Gas Processors Association, Calgary, Alberta, Nov. 24, 1972.)*

Claus unit conversion is significantly improved using catalysts that resist deactivation due to poisoning. Deactivation may be caused by carbonaceous deposits, sulfur condensation, thermal and hydrothermal degradation, and sulfate formation. Sulfate poisoning can cause drastic loss of activity, and performance tests showed significant variations for different commercial catalysts. For alumina and bauxite catalysts the conversion loss is roughly proportional to the concentration of sulfate per available surface area on the catalyst. This conversion loss applies to all the sulfur compounds normally in the stream (hydrogen sulfide, carbonyl sulfide, and carbon disulfide). A new catalyst offers much improved resistance to loss of activity by sulfate poisoning.

29995 **APTIC NO. 52341**

Pfeiffer, Heinz and G. Niederstadt

AIR AND WATER PURIFICATION WITH GLASS FIBER REINFORCED THERMOPLAST CONTAINERS. *(Luft- und Wasseraufbereitung mit GFK-Thermoplast- Behaeltern). Text in German. Wasser Luft Betrieb, 17(6):177-181, 1973. 3 refs.*

Glass fiber reinforced thermoplasts are well suited for air and gas scrubbing because they have the necessary corrosion resistance. A scrubber made of such material is illustrated. It consists of a cylindrical casing in which the nozzles and packed layers are already installed. The air which is to be cleaned flows through the scrubber in axial direction from bottom to top. The scrubbing water is pumped into the scrubber counter-currently to the air flow. If necessary, neutralizing agents can be added by special dosing devices. For separation of the water droplets, a droplet collector is installed behind the scrubber. Depending on the size and operating conditions, a liner made of polypropylene, low-pressure polyethylene, or polyvinyl chloride reinforced with polyester-resin soaked pads or cloth is used. Presently eight different sizes of scrubbers in vertical and horizontal construction are available. The capacity of these scrubbers ranges from 900 to 38,500 cu m/hr. The PVC liners can also be used for stacks. An illustration of a stack with a height of 42 m and a diameter of 160 mm is given. It is supported by means of three stainless steel ropes.

29996 **APTIC NO. 52464**

Porsche, H. and S. Schmeier

MODERN PLANT FOR BROKEN STONES AND DOUBLE BROKEN AND SCREENED CHIPS. *(Moderne Schotter- und Edelsplitt-Aufbereitungsanlage). Text in German. Aufbereitungs-Technik, 14(6):339-345, 1973.*

The initial capacity operation of a processing plant for broken stones and double broken and screened chips is discussed. This plant has been set up with due regard to the new grain sizes as per DIN 66 100 which were introduced in 1973. The many variations possible for the production of different size fractions and the machines and transport equipment are discussed. The erection of the plant is described in a summarized manner, including the dust-collection system of the plant. Two dust collection systems have been installed, one for a capacity of 627 cu m/min and one for 617 cu m/min. The first system comprises tubular bag filters which are cleaned by vibration and reversed air jet. The dust-laden air is passed to the filter through pipes where an underpressure is maintained which is produced by a ventilator. The second dust collection system also mainly comprises cloth filter individual tubular bags. The system is preceded by a cyclone. The second system is installed in the fine gravel station. All dust-laden air is drawn off and passed through pipes in which an underpressure is maintained to the collector. Ventilator and dust collector operation are identical with these facilities in the first station where coarse gravel is produced.

29997 **APTIC NO. 51972**

Porter, M. C. and H. J. Schneider

NUCLEPORE MEMBRANES FOR AIR AND LIQUID FILTRATION. *Filtration Eng., 4(1):8-10, 12, 16, Jan./Feb. 1973. 12 refs.*

Development of a new type of microporous membrane called Nuclepore is described. The new membrane more nearly approaches the idea of a two-dimensional screen with sieve-like filtration. The Nuclepore material has a porosity of 10%, compared to an 80% porosity for the cellulosic material. Nuclepore can be made from a large selection of polymers, although the standard material is polycarbonate film. The polycarbonate material is inert to hydrocarbons, acids, alcohols, photo resists, and most organic solvents, with the exception of halogenated hydrocarbons. Nuclepore membranes have been broadly applied both on a small scale in the laboratory and on a large scale for industrial filtration of various process streams. The membrane has shown unique advantages in the filtration of gases as well as liquids. Because of its effective sealing system and very reliable pore structure, the Nuclepore cartridge coupled with a highly efficient prefilter is ideally suited for air filtration.

29998 **APTIC NO. 51791**

Roettger, Karl

DUST MEASUREMENTS AND COMBATING DUST IN HARD COAL MINES. *(Staubmessung und Staubbekaempfung im Steinkohlenbergbau). Text in German. Glueckauf (Essen), 109(14):721-726, July 5, 1973. 6 refs. (Presented at the Tagung Ergonomie und Arbeit, Dortmund, West Germany, June 8-9, 1972.)*

Although the number of dust measuring instruments in hard coal mines in West Germany has been increased from 0.3 to 0.8 per operating point, a further increase of the measurement density and frequency is desirable. For reduction of the dust emission in mines four methods are available: wetting, increase of the fresh air supply, modification of the drilling machines, and application of dust collection methods. Of the latter, filters are suitable for collection at stationary dust sources. Dust collection at non-stationary dust sources is problematic. The wet collectors applied in this case for air volumes between 100 and 400 cu m/min reach lengths between 10 and 12 m and have diameters of 1-2 m. The noise level is 110 dB. The dust collection efficiencies of 99 and 99.5% are not sufficient. At the moment, it must be concluded dust collectors for mines are in the development state.

29999 **APTIC NO. 52168**

Rolles, Werner

AIR CONDITIONING PLANTS ON THE ROOF. ADVANTAGES AND DRAWBACKS AS WELL AS EQUIPMENT CONCEPTS. *(Klima- und Lueftungszentralen auf dem Dach. Vor- und Nachteile sowie Geraetekonzeptionen). Text in German. Sanit. Heizungstech., 38(3):272-303, March 1973. 5 refs.*

Central air conditioning and ventilation installations mounted on the roof, intended for use especially in apartment buildings, supermarkets, department stores, and office buildings are described. Such equipment can be used optionally for ventilation, cooling, humidifying, and heating as required. The cooling system uses safety coolant for cooling by direct coolant evaporation. Such air conditioning installations help avoid the need of windows, which provide hardly any genuine ventilation because of the highly polluted air in cities.

30000 **APTIC NO. 52179**

Rooth, R., K. O. Hagen, O. K. Beckman, and G. Walker

CONTROL OF INTERNAL AND EXTERNAL ENVIRONMENT IN THE PRIMARY ALUMINUM SMELTING INDUSTRY. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 341-349, 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-24.)*

External and internal control of total fluorine and fluorides in aluminum pot rooms is discussed. Fume collection efficiencies of VS Soderberg pots, open pots with prebaked anodes, and hooded pots with prebaked anodes are, respectively 70, 0, and 90-95%. Medium-pressure fluidized bed scrubbers are frequently used to clean the primary gases from Soderberg and hood prebaked pots. Cleaning efficiencies on total fluorine are 97% on Soderberg gas and 85% on gas from hooded prebaked pots. High-pressure scrubbing of hooded pot gas is necessary to obtain 95% total fluorine cleaning efficiency. Fine particulate fluorides are collected with 97% efficiency by bag filters. For smelters that have based their fluorine economy on wet systems with cryolite recovery, a bag filter installation followed by a low-energy wet scrubber may be the optimal solution. Water tank model studies of air flow patterns are necessary to optimize pot room ventilation with a minium of air. Such studies are particularly important for rooms with open pots and VS Soderberg pots, where 100 and 30%, respectively, of the fumes are emitted on the pot room.

30001 **APTIC NO. 52331**

Saito, Hajime

AUTOMOTIVE EMISSION GAS CONTROL FOR USED CARS. *(Shiyokateisha ni taisuru jidosha haishutsugasu taisaku ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):7-10, Jan. 1973.*

Ignition control, catalytic afterburning, exhaust gas recirculation, water injection, fuel evaporation suppression, blowby gas reduction system, and exhaust gas control during deceleration were studied as emission control systems for used cars. The ignition and catalytic systems gave the most effective control. The ignition control system should reduce hydrocarbons by 7% and nitrogen oxides by 5% or more. The catalytic reaction system should reduce HC by 30% or more when driving 1000 km and should give equivalent or better carbon monoxide control. Metal from the catalyst should not be emitted into the atmosphere as a secondary pollutant.

30002 **APTIC NO. 51896**

Sakanishi, Jun

APPLICATION OF CALCIUM-BASED WET FLUE GAS DESULFURIZATION TO A COAL BURNING ELECTRIC POWER PLANT. *(Sekitan karyoku hatsudensho ni okeru calcium hoshiki haien datsuryu sochi riyo no jisaai). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(6):545-553, June 1973.*

The results of a large capacity calcium-based wet flue gas desulfurization plant installed in a coal burning electric power plant with a capacity of 156 MW are described. The Chemico process was chosen, because of its experience in large capacity scrubber, simple operation and structure, high desulfurization and dust removal efficiency, and comparably low cost. The plant consists of two 1800 KW boost-up fans, three 200-240 Kw recycle pumps, two two-staged scrubbers with a capacity of 385,000 cu Nm/hr, one delay tank, one reheating furnace, one dry and one wet carbide slag container, one ash pond, two sulfur dioxide monitoring devices, and two waste water treatment tanks. Continuous non-stop operation for 202 days showed satisfactory results of 91% SO_2 removal forr emission of 19,000 ppm SO_2. During the operation, several minor problems occurred which have been repaired or solved without stopping the operation of the plant. According to the regular inspection after 202 days operation, no serious damage was found. The cost of the desulfurization plant construction was $300,000. Presently, reclamation of calcium sulfite as plaster or cement is being investigated. Furthermore, incorporation of nitrogen oxide removal techniques into the desulfurization plant is being studied.

30003 **APTIC NO. 51945**

Sano, Hiroshi

ANALYSIS OF NOX REDUCTION TECHNIQUES BY MEANS OF COMBUSTION PROCESS MODELS. *(NOx yokusei gijutsu no kaiseki - nensho purosesu moderu o tsukatte). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(6):27-33, June 1973. 6 refs.*

An analysis of nitrogen oxide reduction techniques is given by means of combustion process models. Temperature and oxygen concentration were the most important factors contributing to NOx reduction and formation. Simplified combustion models were derived for variations in air/fuel ratio, the effect of thermal radiation, non-uniform mixing of air and fuel, and the effect of soot formation as a function of temperature and O_2. Nitrogen oxides formed in rich O_2 and at high temperatures. Typical combustion processes were analyzed for gas, heavy oil, and powered coal combustion. Present NOx reduction techniques were analyzed. The avoidence of high temperature flames is the basic principle of present NOx reduction techniques such as two-staged combustion, exhaust gas recirculation, and long flame combustion. Soot formation should be prevented because it causes temperature fluctuation.

30004 **APTIC NO. 52515**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 3. *(Veiligheidssystemen en luchtverontreiniging. 3). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(8):251-255, April 1973.*

Open and closed systems for the discharge of pollutants into the atmosphere are discussed with special regard to industrial vent stacks. Gases to be discharged should be exempt from components capable of causing corrosion and explosion hazards through condensation. The pollutant concentration discharged is reduced to below the explosion limit through applying a discharge rate exceeding 150 m/sec for rapid dispersion and dilution in the atmosphere. The safe location of vent stack openings is 30 m of suction sites for steam boilers and air conditioners, while a minimum discharge height of 25 m is required. Gas plumes from vent stacks always have positive lifting since they are warmer and lighter than the ambient air. The plume dispersion from vent stacks with discharge velocities exceeding 150 m/sec is best calculated from the American Petroleum Institute method.

30005 **APTIC NO. 52516**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 4. *(Veiligheidssystemen en luchtverontreniging. 4). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(9):285-291, May 1973.*

Waste gas incineration by flares, as applied in the oil and gas industry, especially in oil and gas fields, is described. High flares, ground level flares, and burning pits, of 1.2 to 1.8 m depth, are equally suitable for the burning of stack emissions. Exothermal combustion is possible of gases with calorific values exceeding 8300 kJ/cu m, while gases with calorific values ranging from 4100 to 8300 kJ/cu m require auxiliary fuel for their combustion. Gases with calorific values under 4100 kJ/cu m are not suitable for burning off in torches. Smokeless burning can be achieved by the addition of water vapor which also accelerates the burning fo carbon monoxide. Flame flash back in torches can be prevented through providing a high gas discharge rate, the injection of inert or lean gas, and by inserting a shut-off organ within the torch stack. The Bunsen burner, flat flame, soap bubble, and spherical bomb methods for the determination of the rate of combustion of gases to be burned in flares are described.

30006 **APTIC NO. 52507**

Schwanecke, Rudolf

PLANTS FOR THE DESTRUCTION OF CHEMICAL WASTES. *(Anlagen zur Vernichtung von Chemiemuell). Text in German. Wasser Luft Betrieb, 17(7):227-230, 1973. 6 refs.*

Harmless inorganic waste products from the chemical industry can be dumped, for all other products a number of methods are available. In the past incinerators for this kind of waste usually were not equipped with afterburners or dust collection systems. Sometimes the waste was incinerated in an open flare pit. Nowadays a number of different kinds of incinerators is available. Liquid waste products with little or no solid matter can be incinerated with atomizing burners provided its heating value is 1200 kcal/kg and the viscosity 2-10 deg Engler. The burners can be installed into a simple reverberatory furnace or a rotary kiln. If dust develops in the combustion chamber from inorganic components of the chemical waste products or if halogenated compounds are produced, the flue gas must be cleaned, which is frequently accomplished by scrubbing processes. Incineration by immersion burners dipping into a water tank removes part of the halogenated and nitrified pollutants. If dust is solely present in the waste gas, electrostatic precipitators can be used. For sludges the fluidized bed and story-furnaces can be used. Gaseous chemical waste products can be eliminated by scrubbing or adsorption. Waste gases from mineral oil refineries and petrochemical plants are burned in flares.

30007 **APTIC NO. 51723**

Scott, K. J. and R. B. H. Wills

ATMOSPHERIC POLLUTANTS DESTROYED IN AN ULTRAVIOLET SCRUBBER. Lab. Pract. (London), 22(2):103-106, Feb. 1973. 16 refs.

A simple method for destroying atmospheric pollutants was tested. The method involved passing the contaminated air stream through a scrubber in which the compounds were irradiated with ultraviolet light of wavelengths 185 and 254 nm. Decomposition of the compounds was effected by the excited states of molecular oxygen, ozone, and atomic oxygen. The scrubber was effective in removing carbon monoxide and in decomposing various alkanes and alkenes (olefins), phenol, hydrogen sulfide, and ethyl mercaptan. Automobile exhaust gases and coal gas contaminants were also decomposed by the scrubber. (Author abstract modified)

30008 **APTIC NO. 51973**

Seebold, James G.

CURING FLARE SYSTEMS NOISE PROVIDES MAJOR CHALLENGE. *Can. Petrol., 19(1):53-57, 1973. (Presented at the Petroleum Mechanical Engineering and Pressure Vessels and Piping Conference, New Orleans, La., Sept. 17-21, 1972.)*

Flares are used to safely dispose of excess process gases in industrial plants. A flare could be nothing more than a stack tall enough to safely burn gases at the top. Air would be drawn into the combustion zone almost exclusively by buoyant forces. The flame would be nearly laminar and noiseless. This kind of flame is large, bright, billowy, and smoky. By injecting a high-velocity steam-air mixture into the combustion zone, turbulence intensity is increased and mixing is improved. The flame becomes smaller, stiffer, and smokeless. In flares used to burn excess process gases, injection of steam helps to control the carbon/hydrogen ratio by weight and the temperature in the combustion zone. Unsteady combustion in elevated flares is associated with low flow rates. Experiments and analysis suggest a flame dip limit for large stacks of the order of 1 to 3 ft/sec. Grade-level flares currently are in wider use in Europe than in North America. The modern grade-level flare is refractory-lined and equipped with many burners at the base. Available grade-level flare data is compared with elevated flare data.

30009 **APTIC NO. 52336**

Shigaki, Masanobu

DEVICE TO CLEAN ELECTRODES OF ELECTROSTATIC PRECIPITATOR. *(Denkishujinki no kyokuban soji sochi). Text in Japanese. (Takuma Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 48-21996. 2p., July 3, 1973. (Appl. June 19, 1969, 1 claim).*

A device incorporated in an electrostatic precipitator to clean the dust collecting electrode plates easily and effectively when necessary is described. Dust accumulated on the electrode plates generally has been shaken off by hammering or vibrating the plates; the new device is designed so that the electrode plates may be gradually lifted up and then dropped at once, thus shaking the dust off without any adverse effect on the precipitator. The dust-collecting electrode plates are mounted on the two supporting bars and hung down from them. Two rotary shafts, one alongside of each of the two supporting bars, are provided in such a way that they may be located under the upper frame of each dust-collecting electrode frame. Each rotary shaft is provided with cams, one per electrode plate. The rotary shafts are driven via bevel gears by the motor. As the rotary shafts revolve, the cams attached to the shafts also turn to gradually raise the electrode plates until they become suddenly disengaged from the electrode frames at a certain point, whereupon the electrode plates drop rapidly onto the supporting bars. This rapid drop gives a shock to each electrode plate, thus shaking the dust off. The cams are set in an angle so they may reach the maximum rise point one after another, not at the same time.

30010 **APTIC NO. 52338**

Shioiri, Tagotaro

AIR FILTER. *(Kuki rokafiruta). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-6397. 2p., Feb. 17, 1973. 2 refs. (Appl. May 21, 1970).*

An active carbon-packed air filter element is usually placed in a horizontal position for use since active carbon grains packed inside may settle, leaving an empty portion in the upper section of the element through which air passes unfiltered, if the element is placed vertically. The new active carbon air filter element designed to permit vertical use is free of such a defect. A sack of knit netting is first packed with granular active carbon. The sack with the active carbon is then sandwiched between two lattice nettings made of wires; the mesh size is 20-25 mm square. The upper and lower ends of the sack and the lattice nettings are securely held in place by means of U-shaped plastic frames. Set up as above, the active carbon-packed sack is pressed inward from both sides by each horizontal thick wire of the lattice nettings, thus forming a number of bottle necks in the sack. This prevents the active carbon grains from falling toward the bottom of the sack since they are securely held in each small section formed by each of the two bottle necks, even when the filter element is used in the vertical position.

30011 **APTIC NO. 52463**

Shirai, Futami

EXHAUST GAS CONTROLS VIEWED FROM ELECTRONICS. *(Erekutoronikus kara mita haikitaisaku). Text in Japanese. (Gijutsu to Kogai (Tech. Pollut), 3(1):74-77, Jan. 1973. 3 refs.*

The basic makeup of an electronic exhaust gas control system consists of a sensor represented by a thermistor that detects the temperature of a given part, the control unit (electronic device) that processes the information received from the sensor and determines whether to transmit it to activate the actuator, and the actuator that operates according to the control signal from the control unit. An electronics device is employed with the throttle opener incorporated in the Mitsubishi automobiles exported to U.S.A. The throttle opener is an exhaust gas control system designed to avoid a complete closure of the throttle valve even when the foot is taken off the accelerator pedal for engine braking. In such a case, the electronic device detects the engine revolution and determines the working range of the throttle opener. The device is composed of about 60 electronic parts. Another example of electronics application to the automotive exhaust gas control is seen in the Mazda rotary engines. The electronic device incorporated in the rotary engine determines the ignition timing, injects secondary combustion air, and actuates other exhaust gas control mechanisms according to the operating conditions of the engine. Accurately timed ignition with powerful spark contributes to improved automotive emission. Developed along this line is the contactless igniter (transistor igniter).

30012 **APTIC NO. 51937**

Speight, G. F.

BEST PRACTICABLE MEANS IN THE IRON AND STEEL INDUSTRY. *Chem. Engr. (London), 9(271):132-139, March 1973. (Presented at the Institution of Chemical Engineers, London and South Eastern Branch, Emissions to the Air Symposium, London, England, Nov. 9, 1972.)*

The control limits specified for grit, dust, fume, and sulfur dioxide emissions from various iron and steel-making processes and the best practicable means for achieving them are discussed. Dry electrostatic precipitators are used for both strand sinter discharge gases. Emissions from coke charging ovens are treated in smokeless charging cars that burn and then clean the waste gases in a wet scrubber. No special measures for control of emissions from coke discharging ovens are available, but speedy discharging and shields over the coke guides are helpful. Quenching of hot coke is usually carried out in quenching towers fitted with grids or baffles. A three-stage cleaning system comprising a dust catcher, washing tower, and wet electrostatic precipitator is required for blast furnace gas. The fine iron oxide fume produced by the oxygen injection process is the industry s most difficult waste-gas cleaning problem. Dry electrostatic precipitators with a waste heat boiler provide satisfactory control of fume emissions from open hearth furnaces using injected oxygen. The LD, Kaldo, and Rotor oxygen converters require limited combustion with high energy wet scrubbers or, in the case of the Rotor process, dry electrostatic precipitators. Techniques for achieving limited combustion include pressure regulation and the provision of a curtain of combusted gas or of injected nitrogen. Fumes from large electric arc furnaces are contained by direct or semi-direct extraction followed by cleaning in wet electrostatic precipitators or high-energy scrubbers. Cleaning systems for medium and small arc furnaces are direct extraction with a high-energy scrubber and semi-direct extraction or roof hoods with bag filters, respectively. Wet electrostatic precipitators are used on deseaming units.

30013 **APTIC NO. 52140**

Takahaski, Kazumi

ELIMINATION OF DUST AND HARMFUL GASES EMITTED FROM A GARBAGE- BURNING FURNACE USING AN AIR WASHER AND DUST CLEANER TESTING PLANT. *(Ea-washa-gata jojin tesuto puranto ni yoru gomi shoukyaku shisetsu no baijin yugai gasu no jyokyo ni kansuru chosa jirei). Text in Japanese. Yosui to Haisui (J. Water Waste), 15(3):353-367, March 1973. 9 refs.*

A pilot plant was studied for efficient and economical elimination of dust and hydrogen chloride from the emissions of a furnace burning garbage. Under the experimental conditions of 1 L/G ratio, 1.0 kg/sq cm spray pressure, double spray device (counter flow or parallel flow), and 170 l/min water flow, the dust and HCl removal efficiencies averaged 65% and 55%, respectively. The values were better than generally accepted values; however, adjustments of the L/G ratio and the surface velocity of inflow and outflow gases may increase the elimination efficiency. The conventional coal dust measuring method is not appropriate for this dust, since the dust particle size varies widely. Another type of dust trapping sampling method might be more suitable. The HCl elimination efficiency with scrubbing was 50-60%. The addition of hydroxides to the wash water may increase removal efficiency. The removal efficiencies for dust and HCl may be increased to 70% and 60%, respectively, if the exhaust gases are washed under the following conditions: 0.5-1.0 L/G, 1.0-1.5 kg/sq cm spray pressure, 150-200 m/min surface velocity, and 200-300 C treatment temperature. Therefore, this control method is satisfactory for a medium sized (200 tons/day burning capacity) garbage-burning furnace.

30014 **APTIC NO. 52332**

Takehara, Toshio and Shigenori Ito

HIGH-STRENGTH CERAMIC HONEYCOMB STRUCTURE. *(Kokyodo seramikkushitsu hanikamu kozotai). Text in Japanese. (NGK Insulators Ltd., Nagoya (Japan)) Japan. Pat. Sho 48-22964. 5p., July 10, 1973. 1 ref. (Appl. March 22, 1968, 1 claim).*

When a conventional honeycomb structure is used as the heat accumulator for an afterburner, it must be reinforced with a hub on the inside and a rim on the circumference to provide needed mechanical strength. The hub and rim are bonded to the honeycomb structure with a bonding agent. In an automobile, the afterburner can be heated to over 1000 C; this high temperature plus vibrations can separate the honeycomb from the hub/rim structure. A new honeycomb structure is described which uses no hub or rim which must be bonded on. The corrugated plates used to make up the rim and hub have a smaller height than those used between them, so that the external and internal portions making up the hub and rim give the required strength usually obtained by separate rim and hub rings.

30015 **APTIC NO. 51836**

Tempel, F. G. and V. V. Osinovskiy

TWO PROBLEMS OF NON-STATIONARY GAS FILTRATION IN POROUS MEDIA. *(Dve zadachi po nestatsionarnoy filtratsii gaza v poristoy srede). Text in Russian. Izv. Akad. Nauk Uzb. SSR, Ser. Tekh. Nauk, no. 1:64-66, 1973. 3 refs.*

Two solutions of differential equations describing one-dimensional, non-stationary gas filtration in porous media, subject to non-linear resistance law, are presented; one for automodel, and another for non-automodel gas motion.

30016 **APTIC NO. 52440**

Terao, Kunio

EXHAUST GAS CLEANER. *(Haikigasu jokasochi). Text in Japanese. (Okamura Mfg. Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 48-16953. 2p., May 25, 1973. (Appl. Dec. 25, 1970, 1 claim).*

A system is described wherein steam is mixed with exhaust gases and cooled to a point of supersaturation so that water droplets are formed with fine carbon particulates as the nuclei. Since the droplet is several tens of times larger than its core, it can be easily removed by filtration. The kinetic energy and heat of the exhaust gas is utilized to atomize and evaporate water, thereby producing the steam. The used water is recirculated to the main unit.

30017 **APTIC NO. 52075**

Thompson, K.

INTEGRATING DUST CONTROL EQUIPMENT INTO THE MANUFACTURING PROCESS. *Chem. Process. (London), 19(4):83-85, April 1973.*

Careful factory design can significantly reduce or even eliminate the need for air pollution control devices. Concentrating the contaminants into the smallest possible volume of air, avoiding discharge of finely-divided materials down long chutes, using low-sulfur-content oil or gas firing, and continuously wetting open stockpiles of finely-divided materials will bring about a reduction in the production of contaminants. In places where dust is produced, it can be contained through the use of an enclosure designed to create a controlled air velocity. The use of chute baffles, buffer storage in hopper bases, overhead canopy-type hoods, and proper ductwork design is also helpful.

30018 **APTIC NO. 52155**

Tokuhisa, Yoshiro

DESULFURIZATION BY DECOMPOSITION OF HEAVY OIL. *(Juyu no bunkai ni yoru datsuryu). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(3):161-164, March 1973. 4 refs.*

Various methods of desulfurization of fuel oil are discussed, and cost comparisons are made. The methods reviewed in the catalytic contact category are the fixed bed catalytic contact method, the H-oil method, the BOC Isomax method, and the fluidized catalytic contact method (FCC). In the thermolysis and solvent extraction category, the delayed coking method, the flexicoking method (field coking), the pithbreaking method, and the solvent deasphaltizing method are discussed. In the area of fuel gasification method, partial oxidation, gasification power production, the Ube-type heavy oil gasification fluidized bed method, the Kureha-type heavy oil high temperature decomposition method, and the IGT hydrogenation gasification method are discussed. The gasification technique has not produced desirable results yet and the full operation is not yet expected at the present stage of development.

30019 **APTIC NO. 52460**

Toyota, Fujio

DISPOSAL TECHNIQUES OF OFFENSIVE ODORS ACCOMPANIED BY MARINE PRODUCTS PROCESSING. *(Suisankako ni tomonau akushu no shorigijutsu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(3):362-370, July 1973.*

With the enforcement of the Offensive Odor Control Law effective May 31, 1972, the marine products processing industry is required to take offensive odor control measures to comply with the odor control criteria set forth in the related regulations. Marine products processing in Japan can be roughly classified into minced fish-meat manufacturing, fried or boiled fish-meat paste manufacturing, canned fish manufacturing, and fish bone/intestinal processing to manufacture feed stuffs such as protein, oil and fat, or bone meal. While the first two types in general cause few odor problems, the last involves grave odor problems. The odorant components emitted from marine products processing factories, especially from fish bone/intestinal processing factories, have been analyzed to include ammonia, amine, fatty acid, mercaptan, and hydrogen sulfide. Basic approaches to deodorization are dilution with air, destruction, adsorption, and scrubbing (absorption) with acidic or alkaline solution. The incineration-type deodorization method is considered most effective, giving almost 100% deodorization. The incineration method is widely used in the U.S.A., where it is compulsory for fish and animal bones/intestinal processing, feed manufacturing, and other similar factories. A flow chart of the incineration type deodorization process describes the principles of the process.

30020 **APTIC NO. 51897**

Tsuji, Schoichi

THEORY OF REDUCTION OF NITROGEN OXIDES FORMATION. *(Chisso sankabutsu seisei yokusei no riron). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(6): 20-26, June 1973. 3 refs.*

Theoretical investigations were made on a low nitrogen oxides burner and a low NOx combustion chamber as a means to reduce NOx formation. Assuming an ideal burner with uniform flame temperature and oxygen concentration, the amount of NOx formation was expressed as a function of temperature, nitrogen concentration, O2 concentration, and residing time of gases in the flame. Based on this equation, the equation for nitric oxide formation characteristic value (NO charac.) was derived as a function of flame size. This equation was applied to the case of multiple flames with a little modification. The numerical calculation of NO charac. for a single flame burner indicated that NO charac. increased with increasing flame size, and after reaching a maximum, it decreased with further increase in flame size. In a multiple burner, the flame temperature and residing time decreased so that NOx formation was restrained. The flame patterns in a combustion chamber were analyzed, and four models were derived. The detailed theoretical investigations were carried out on these four models in terms of flame temperature, flame thickness, and combustion load. When the flame filled the chamber or the flame propagated along the wall, the lower maximum temperature and uniform temperature distribution could be obtained. The residing time of the surface combustion on the wall was lower than the full chamber combustion above a certain flame thickness. Therefore it can be expected that the formation of NOx becomes minimum and the heat efficiency is improved. The front firing was an ideal combustion method for an extremely low NOx combustion chamber, because the residing time of gas molecules in flame was shorter in the front firing than in the tangenial firing. The maximum flame temperature potential was proportional to the surface combustion load per unit heat transfer surface area.

30021 **APTIC NO. 51834**

Urlaub, Alfred

POLLUTANT FRACTIONS OF DIESEL ENGINE EXHAUSTS. *(Schadstoffanteile von Dieselmotorenabgasen). Text in German. TUE (Tech. Ueberwach.), 14(6):169-172, 1973.*

In the Federal Republic of Germany, diesel engines contribute about 5% of the carbon monoxide, 15% of the hydrocarbons, and about 35% of the oxides of nitrogen to the total emissions by traffic. This indicates that reduction of the NOx emission is by far the most urgent problem. The simplest method for reducing these emissions is to delay the ignition. Less power, higher fuel consumption, and more soot in the exhaust gas would be the consequence of this measure. One of the most efficient means of combating the NOx emission would be exhaust gas recirculation. It would cause a negligible increase of the CO emission. The power is not affected, and the fuel consumption increases by 2%, but only in the higher load range. The deterioration of the engine power, fuel consumption, and soot emission through an injection delay can be avoided by exhaust gas turbo-charging. The results of several variations of a combination of exhaust gas turbo-charging, delayed injection, and exhaust gas return are illustrated graphically. The oxides of nitrogen concentration can be reduced to 2 g/HP with exhaust gas recirculation which is controlled in dependence of the load and through cooling of the exhausts gas-air mixture. The engine power remains unchanged through this.

30022 **APTIC NO. 52343**

Utsumi, Hachiro

EXHAUST GAS CONTROL TECHNIQUES IN SATURN ENGINE. *(Satan enjin ni okeru haishutsugasu taisaku gijutsu). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):16-25, Jan. 1973.*

The Saturn engine features a design in which engine modifications and other measures are made to keep the exhaust emissions to a minimum. The exhaust gas control system incorporated in the new Mitsubishi automotive engines are called MCA (Mitsubishi Clean Air System) characterized by the MS (minimum surface) type combustion chamber featuring smaller S/V (surface area/volume), the V-form valve arrangement and cross flow OHC mechanism, the inlet port designed to cause powerful vortex current of the mixture gas for the combustion chamber, the perfect mix carburetor supplying the optimum fuel, the center ignition system giving higher firing efficiency, the wide-area hot water heating intake manifold, the idle compensator that prevents carbon monoxide emission at high temperatures, the idle limiter minimizing the CO emission during idling, the valve seat already prepared for the use of no-lead gasoline, the two-way closed system blowby gas reduction device, the distributor designed with priority given to exhaust gas control, and the cam profile and valve timing designed to minimize emission of harmful gases. The MCA system met the U. S. 1973 and 1974 automotive emission criteria. With an automatic transmission Dodge Colt, for example, the emission values were 1.67 (g/mi) for hydrocarbons, 28.1 for CO, and 1.77 for nitrogen oxides when new, and 1.73 for HC, 29.9 for CO, and 1.78 for NOx after 50,000 miles of driving. The 1973-74 U. S. control criteria are 3.4 for HC, 39 for CO, and 3.0 for NOx. However, the MCA system has to be strengthened by further engine modifications and/or supplemented with a thermal reactor or catalytic converter in order to meet the 1975/76 emission criteria.

30023 **APTIC NO. 52199**

Vandegrift, A. E., L. J. Shannon, and P. G. Gorman

CONTROLLING FINE PARTICLES. *Chem. Eng., Deskbook, 80(14):107-114, June 18, 1973. 24 refs.*

A study on collection equipment efficiency and the latest new methods to cope with pollutant particles smaller than 2 micron are presented. All the adverse effects of these fine particulates are documented. The extent of the fine particulate problem by accurate measuring techniques is defined. For accurate determination of particle size distribution, a collection mechanism that collects submicron particles and causes neither formation nor breakup of aggregates is necessary. Small electronic precipitators, thermal precipitators, and cascade impactors are investigated for the measurements. The Coulter Counter, Differential sedimendation, and optical techniques are described for the use of particle size measurement. Fine particles are controlled by the same equipment available for removing fine particles such as electrostatic precipitators, fabric filters, scrubbers, and afterburners. Over 95% of the data currently available on the particle size of materials emitted from industrial sources has been obtained by sampling and sizing techniques that are not suitable for the size range of less than 2 micron. The available frictional efficiency data are evaluated using log-probability coordinates to magnify the efficiency for smaller particles. Theoretically, improvements in control of fine particles might result from better exploitation of collection mechanisms such as diffusiophoresis and thermophoresis or agglomeration methods. A brief presentation of the theoretical aspects and experimental results for these mechanisms is given.

30024 **APTIC NO. 52490**

Vasilescu, C. A. and C. Silvestru

STUDY OF THE INFLUENCE OF CERTAIN FUNCTIONAL AND STRUCTURAL FACTORS ON THE GENESIS OF CARBON MONOXIDE IN SPARK IGNITION ENGINES. *(Analyse de l influence de certains facteurs fonctionnels et constructifs sur la genese de l oxyde de carbone dans le moteur a allumage par etincelle). Text in French. Rev. Roumaine Sci. Tech. Electrotech. Energet., 18(1):125-141, 1973. 4 refs.*

Evidence of thermal and chemical inequality prevailing at the end of combustion in gases contained in the cylinders of spark ignition engines is arrived at by mathematical analysis. Under certain conditions the first portion of the fuel-air mix undergoing combustion does not have the highest temperature at the end of combustion. This thermal inequality affects formation of carbon monoxide only in case of poor or stoichiometrically correct mixes. Analysis of the effect of the air-fuel ratio, of spark ignition advance of combustion velocity, and of the shape of the combustion chamber on the generation of carbon monoxide during combustion has demonstrated that the latter depends primarily on the fuel-air ratio; in rich mixes the amount of carbon monoxide generated is so large that the elevated temperature of the combustion gases and the resulting gas dissociation influences the carbon monoxide concentration very little. Reduction of CO generation seems possible by correlating a delayed ignition advance with a less compact form of combustion chamber and with a fuel mix which is on the poor side. Such an arrangement would have the disadvantage of worsening the power output of the engine and its economy.

30025 **APTIC NO. 52498**

Vavro, K.

CENTRIFUGAL DUST SEPARATOR. *(Odstredivkovy odlucovac prachu). Text in Czech. Strojirenstvi, 23(4):206-212, 1973. 4 refs.*

Fly ash separation experiments were conducted on a laboratory model of a combination of a plate centrifuge with a cyclone. The centrifuge rotates in a cylinder with a conical part narrowing downward into a dust collector. The gas to be cleaned enters the cylindrical part tangentially, moves in a spiral movement downward propelled by the concurrent movement of the centrifuge. Particles of all sizes initially deposited between the plates of the centrifuge or on the inner walls of the cylinder by the centrifugal force in the end fall through their own weight into the hopper underneath, while the purified gas leaves the machine through a vertical tube in the center. A mathematical model is derived from results obtained with this separator describing the separating process in mathematical terms. A procedure for the calculation of separation efficiency is outlined. The effect of dust concentration on the separation process will depend on aggregability, shape, fractional composition of particles, and on other parameters whose effects were not studied separately; thus the equations derived are valid only for power plant fly ash which was actually used in the experiments. The combination separator is suitable for the purification of waste gas with a lower particle size limit of 1 micron and an hourly flow volume up to 1200 cu m. The entering gas can contain up to 600 g/cu m dust.

30026 **APTIC NO. 51827**

Viehrig, J.

MEASURES FOR THE MAINTENANCE OF CLEAN AIR BY THE ARTIFICIAL SILK PRODUCTION PLANT PIRNA PRODUCING MAINLY VISCOSE SILK. *(Massnahmen zur Reinhaltung der Luft aus der Sicht des Kunstseidenwerkes Pirna im Stadium der Erzeugung von Viskoseseide). Text in German. Technik (Berlin), 28(7):460-464, July 1973. 9 refs.*

In the synthetic silk production plant of Pirna (East Germany) mainly viscose silk is produced, for which large amounts of carbon disulfide are used. During the production process, part of the CS2 is chemically converted to hydrogen sulfide. About 80% of the CS2 and H2S are liberated at the spinning process in the form of vapor and gas. The remaining percentage is also eventually discharged into the atmosphere. The present production of viscose fiber in Pirna is 11,000 tons/yr, which means that 12 tons/day of CS2 are needed. In the vicinity of the plant, ground level concentrations of up to 0.14 mg/cu m were measured. Two methods are available for reducing the emissions: all waste air is combined and discharged through a stack of sufficient height, or recovery and conversion of the pollutants takes place. In the case of Pirna, the construction of a high stack could not be realized. Therefore, a recovery process has been developed for a gas of the composition: CS2 350 to 500 g/cu m H2S 150 to 300 g/cu m, carbon dioxide 150 to 300 g/cu m, and oxygen 12% by volume. A two-stage scrubbing process removes first the H2S with 200 g/l sodium hydroxide. The temperature of the NaO is between 70 and 90 C, the reaction time less than 0.3 sec. For the removal of CS2, three oils were tested: spindle oil, tetralin, and diesel oil. The first oil yielded the purest CS2 but the lowest specific loading of the oil; tetralin spoils the CS2; diesel oil had the disadvantage that it volatilized in part. It has the advantage, however, that it could be loaded with up to 190 g CS2/kg oil. Based on these experiments, a large plant has been designed. It is planned to have a pilot plant in operation by 1975/76. The investment costs of the plant are estimated to run at 5 million dollars.

30027 **APTIC NO. 52066**

Vinnikov, L. I., I. P. Mukhlenov, I. G. Lesokhin, and G. N. Buzanova

ADSORPTION OF SULFUR DIOXIDE FROM HUMID AIR BY MEANS OF INDUSTRIAL ADSORBENTS. *(Adsorptsiya dvuokisi sery iz vlazhnogo vozdukha promyshlennymi adsorbentami). Text in Russian. Khim. Prom. (Moscow), no. 2:45-48, 1973. 32 refs.*

Adsorption under equilibrium conditions of sulfur dioxide and water vapor in air at 20 C on SKT-2 type activated carbon, ShSM type silica gel, and NaX ceolite was studied. Weak and strong bonds of SO2 on activated carbon were distinguished. Weakly bound SO2 requires slight heating for its desorption, while strong bonds of SO2 require temperatures above 200 C for desorption. Two different types of adsorption centers on the surface of activated carbon were distinguished; active carbon-oxygen complexes adsorbing SO2 and water vapor, and another type of adsorption centers formed probably by hydrogen bonds of molecules of adsorbed water, which play a role primarily in the adsorption of water vapor as secondary adsorption centers. Competition between SO2 and water vapor in such secondary adsorption centers was evidenced. This interaction between SO2 and water vapor may represent an initial phase in the conversion of SO2 molecules on the surface of the activated carbon.

30028 **APTIC NO. 52068**

Walsh, James R. and U. Rus Hugi

INSTRUMENTATION OF A SULPHUR DIOXIDE REMOVAL TEST FACILITY USING ALKALI SCRUBBING. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 15p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-B-1.)*

Flue gas scrubbing with alkaline solutions is one of the oldest methods of removing sulfur dioxide from the flue gas. Interest in alkaline scrubbing has continued because of its basic simplicity and comparatively low cost capital. Drawbacks of alkaline scrubbing are the tendency for accumulation of solids to plug the system, scaling, corrosion and erosion problems, and the need to dispose of large quantities of waste. Instrumentation loop applications to a 90,000 cu ft/min alkali scrubbing test facility, the process problems the instrumentation engineer faces in selection of equipment, and the performance of the instruments selected and the problems encountered during start-up are discussed. The alkali scrubbing test facility incorporates centralized electronic process control with a digital data acquisition system provided a log process variables and print-off normal conditions. Flue gas SO2 content is measured by Ultraviolet analyzers and analysis of the total gas stream is measured by gas chromatographs. Powdered limestone is injected into the furnace; flue gases are then cooled and wet scrubbed with a recycled aqueous suspension of lime or limestone. (Author abstract modified)

30029 **APTIC NO. 52300**

Walther, J. E., H. R. Amberg, and H. Hamby, III

MEETING NEW POLLUTION REQUIREMENTS AT A PAPER MILL. *Chem. Eng. Progr., 69(6):100-103, June 1973. 3 refs.*

The technology of magnesia base pulping and its relationship to air pollution and air quality control are examined. The magnefite pulping system was designed to meet state and local air pollution regulations. Sulfur dioxide emissions of 20-30 lb/t of pulp represent about an 80% reduction from the calcium base process. Recovery furnace particulate emissions range within 2-4 lb/t of pulp, with concentrations of inorganic particulates at 3 lb/t of pulp. Nitrogen oxide concentrations in the stack gas are about 125 ppm, and sulfur trioxide and sulfuric acid mist concentrations average less than 10 ppm. To further reduce SO2 emissions from the various process steps, venturi scrubbers were installed, and the SO2 from the furnace gases is absorbed and recovered.

30030 **APTIC NO. 52350**

Wandrey, Christian and Albert Renken

INFLUENCE OF PERIODIC CONCENTRATION VARIATIONS ON THE PRODUCT DISTRIBUTION OF HYDROCARBON OXIDATION. *(Zur Beeinflussung der Produktverteilung durch periodische Konzentrationsschwankungen bei der Oxidation von Kohlenwasserstoffen). Text in German. Chem.-Ing.-Tech., 45(12):854-859, 1973. 15 refs.*

The influence of enforced concentration variations on the performance of a catalytic reactor was studied. As an example the oxidation of hydrocarbons on a platinum gauze was chosen. The period was varied between 0 and 120 sec. The temperature problems at high conversion and steady-state processing were avoided by periodic operation. In the case of butane oxidation, the average catalyst temperature was increased from 252 to 372 C with increasing length of period. With the oxidation of cyclohexene as an example, it could be shown that it is possible to influence the product distribution by periodic operation. The selectivity of the intermediate carbon monoxide was a function of the length of period and in our experiments varied between 7 and 55%.

30031 **APTIC NO. 51938**

Ward, P. A. and D. Watson

BEST PRACTICABLE MEANS AND THE CEMENT INDUSTRY--THE CONTROL OF DUST EMISSIONS AT CEMENT FACTORIES. *Chem Engr. (London), 9(271):124-131, March 1973. (Presented at the Institution of Chemical Engineers, London and South Eastern Branch, Emissions to the Air Symposium, London, England, Nov. 9, 1972.)*

The Alkali Inspectorate s present dust emission requirements for cement works and the principal potential emission sources in a typical modern cement factory are illustrated. Electrostatic precipitators are recommended for treatment of very large gas volumes and flow rates, particularly where high humidities and temperatures are encountered, e.g., the main kiln exhaust, clinker cooler exhaust, and the ventilating air from large mills. Vertical plate, horizontal gas flow precipitators are used for large wet and dry process plants, while vertical tube precipitators are often used for smaller kilns. Fabric filters are preferred for smaller gas flows while temperature and humidity are not excessive, e.g., at conveyor transfer points, cement packing and loading plants, and for ventilation of smaller mills. Other dust problems at cement works include low-level dust and the production of agglomerates of the very fine particles which pass through precipitators. One mill eliminated the former problem by concreting its entire central area and hopes to solve the latter problem through use of an auxiliary furnace to prevent unusually low temperatures in the stack. Approved sampling methods for particulate and fume emissions are summarized.

30032 **APTIC NO. 51999**

Watkins, C. H., R. J. Parker, and J. M. Pharis

DESULFURIZE KUWAIT REDUCED CRUDE. *Hydrocarbon Process., 52(5):89- 92, May 1973. 3 refs. (Presented at the American Petroleum Institute, Refining Division Meeting, Philadelphia, Pa., May 16, 1973.)*

Fuel oils of 0.3 wt% sulfur content can be produced from relatively low-metal reduced crudes, which constitute a large portion of the world s export crude oils. Direct desulfurization by the RCD Isomax process can provide the near-future requirement of severe sulfur restrictions. Residual desulfurization is reviewed at two severity levels: the first representing present sulfur restrictions in many large U. S. cities: the second showing the present sulfur limit for a few congested urban areas, is projected as a general requirement for most U. S. cities in the near future. A commercial operation to 1.0 wt% sulfur product is discussed and compared to a pilot plant operation using a modified flow scheme to produce 0.3 wt% sulfur product. The economics of each of these operations are given in some detail.

30033 **APTIC NO. 51736**

Watson, H. C.

CONTROLLING INTERNAL COMBUSTION ENGINE EMISSIONS. *SAE-Australasia, 33(1):2-12, Jan.-Feb. 1973. 21 refs. (Presented at the National Convention, Melbourne, Australia, Oct. 21, 1972, Paper 18.)*

The control of emissions from internal combustion engines is discussed. Crankcase emissions, evaporative emissions, and the origin of pollutants in the exhaust are reviewed. Conventional methods used to produce 99.8% clean exhaust gas are described, including air-fuel ratios, fuel injection, and exhaust gas recirculation. The advantages and drawbacks of each method and the apparatus used in each method are compared as to their ability to reduce hydrocarbons, carbon monoxide, and nitrogen oxide emissions. The consequences of various levels of exhaust emission control are estimated in terms of their economic cost and social benefit in reduced air pollution. Proposals were made for more radical techniques of emission control which would be implemented by 1981. Alternate methods of vehicle pollution control include reducing vehicle size, the use of gaseous fuels, improved engine maintenance, and the use of alternative types of engines.

30034 **APTIC NO. 52178**

Wesner, R. F., P. T. Luckie, and E. A. Bagdoyan

CARBON PASTE TECHNOLOGY -- 1973. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 613-636, 1973. 4 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-45.)*

Carbon paste used in the production of anodes for use in aluminum potlines is one of the major ingredients required in the production of aluminum. A typical carbon paste plant comprises five basic operations: incoming raw materials handling and process storage; crushing and sizing; pitch handling; paste preparation blending and mixing; and controls and instrumentation. The impact of the Clean Air Act Amendments of 1970 and the Occupational Safety and Health Act of 1970 on carbon plant design and operation is reviewed. Some of the requirements of the legislation can be met through use of a rotary coke calciner, venting of process equipment to dust collectors, housekeeping and maintenance, and recycling of waste materials. A rotary coke calciner is equipped with an integral incinerator chamber which burns all the evolved particles and discharges to the atmosphere only the products of combustion. When operated under stabilized conditions, there is little or no visible effluent.

30035 **APTIC NO. 52094**

Wickes, H. G., Jr. and J. B. Whitchurch

FLUORINE CONSUMPTION TRENDS OF THE ALUMINUM INDUSTRY. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 21p., 1973. 10 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25- March 1, 1973, Paper 73-H-50.)*

The factors and trends of fluorine consumption in the aluminum industry during the next decades are discussed. Virtually all fluorine consumed by the aluminum industry is as the electrolyte of the Hall-Heroult process for producing primary aluminum. A small amount of fluorspar is used, but most fluorine is consumed as either aluminum or cryolite. Some fluorine-containing materials are used in secondary aluminum production. Increasingly stringent restrictions on the emission of pollutants and the continuing cost-price squeeze factors are taken into consideration in the analysis of the future of the primary aluminum industry. In the future, much more fluorine will be recycled, thereby reducing the demand for new fluorine. Hydrogen fluoride fume scrubbing and fluoride recovery are discussed in detail. Fluoride recovery is also economically evaluated.

30036 **APTIC NO. 51968**

Williams, J. E. and J. H. Dressel

COAL GASIFICATION-THE NEW ENERGY SOURCE. *Can. Mining Met. Bull. (Montreal), 66(730):72-77, Feb. 1973. (Presented at the Canadian Mining and Metallurgical Institute, Annual Western Meeting, Saskatoon, Sask., Oct. 1972.)*

A brief review of coal gasification procedures available today and processes that may be available in the future are presented. Examples are given as to how the process might be used in power plant applications. The effect on pollution level and power costs, and some thoughts on the added burden that might be placed on mining and coal preparation are described.

30037 **APTIC NO. 52471**

Winklepleck, R. G. and S. Suda

CONSIDERATIONS IN CONVERTING EXISTING KRAFT RECOVERY UNITS FOR AIR EMISSION CONTROL. *TAPPI, 56(6):73-77, June 1973. 12 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Engineering Conference, New Orleans, La., Oct. 1-5, 1972.)*

Many pulp mills must evaluate problems and alternatives in meeting newly established or proposed air emission codes for existing kraft recovery units. Unacceptable air emissions from these units are categorized as particulates (salt cake fume), malodorous gases (hydrogen sulfide and organic sulfides), and sulfur oxides. Process and equipment modifications can be made to reduce emissions. Factors influencing the selection of a system modification or conversion are: the nature of existing equipment, specific mill chemical and steam balances, existing or proposed codes, space availability, and conversion downtime. Technical considerations are discussed in analyzing possible recovery system alterations. No generalized conclusion can be made as to an optimum approach for the industry. Control methods include black liquor oxidation and omission of the direct contact evaporator (the firing concentration is achieved instead by extension of the multiple-effect evaporator system).

30038 **APTIC NO. 52339**

Yamagishi, Giichi

PRESENT STATE OF EXHAUST GAS CONTROL. *(Haikitaisaku no genjo ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):32-35, Jan. 1973.*

Several engine modifications are being developed to enable present automobiles to meet the 1976 emission standards. These include hydrocarbon emission control during deceleration, improvement of ignition timing, lean mixture carburetor, exhaust gas recirculation, air injection, thermal reactor, catalytic afterburner, and a reduction catalyst. In a combined system, at cold start, a large quantity of secondary air can be supplied to the thermal reactor by an air injection pump so that HC and carbon monoxide are removed and the temperature of the catalyst raised. When the catalyst begins to react and the temperature rises, the secondary air quantity is reduced to put the reduction catalyst in a reducing atmosphere for purification of nitrogen oxides. Secondary air is fed in before the oxidation catalyst for removal of HC and CO. When the temperature of the catalyst layer is too high, the bypass valve functions to change the exhaust route from normal to emergency, so the exhaust gas will be treated by a highly heat-resistance emergency catalyst. This protects the ordinary catalyst provided in the normal route.

30039 **APTIC NO. 51924**

Yamanaka, Tatsuo

UTILIZATION OF A CATALYST IN AIR POLLUTION CONTROL, SECOND SERIES (4). *(Zoku Kogai boshi gijutsu ni okeru shokubai no riyo). Text in Japanese. Kagaku Kogyo (Tokyo), 24(7):968-974, July 1973. 11 refs.*

The state of the art in the catalytic removal of nitrogen oxides in the presence of oxygen or sulfur dioxide is reviewed. The catalytic reduction of Nox by carbon monoxide over alloy catalysts requires higher reaction temperatures than with palladium catalysts, but these catalysts are highly active and stable at the high temperatures. These catalysts require excess amounts of CO to obtain high reduction of NOx. The NOx removal efficiency over the stainless steel wire cloth decreases with increasing O2 due to the reaction of O2 with CO. The decrease in NOx reduction efficiency in the presence of O2 has been demonstrated for copper chromate, copper oxide-alumina, and copper chromate-barium oxide catalysts. In nitric oxide manufacturing, mixtures of NOx with large amounts of O2 can be reduced over platinum catalysts; but the lifetime of the catalyst is short. Highly active catalysts for ammonia decomposition can be very effective for NOx reduction by NH3. The catalytic oxidation of nitric oxide to nitrogen oxide is reviewed. In the simultaneous catalytic reduction of NOx and SO2, hydrogen sulfide, NH3, CO, and magnesium hydroxide are prospective catalysts. Carbon monoxide is the most promising catalyst. Several presently available catalytic processes for the reduction of NOx in the presence of SO2 are listed.

30040 **APTIC NO. 52110**

Yanagihara, Shigeru

CONTROL TECHNOLOGY AGAINST NITROGEN OXIDES FROM AUTOMOBILES. *(Jidosha no haiki chisso sankabutsu taisaku gijutsu). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(2):116-123, Feb. 1973.*

The catalytic treatment of automobile exhaust gas has been studied for some time; but the reduction of nitric oxide is a comparatively new idea because the space velocity, temperature, and oxygen partial pressure are less controllable than with oxidizing catalysts for carbon monoxide and hydrocarbons, and the decomposition of NO is basically difficult. Usually NO is treated by reduction in which NO is reacted as an oxidizing agent for CO, hydrogen, and ethane to form carbon dioxide, water, and nitrogen. Platinum, copper oxide, manganese, monel metal, and composite copper/nickel/graphite catalysts have great activity. Nitrogen oxides are the greatest pollution problem from automobiles. High air/fuel ratio, exhaust gas recirculation, and reduction and oxidation catalysis can be used to control NOx.

30041 **APTIC NO. 52356**

Yukitomo, Masatsuna

MEDIUM- AND SMALL-SCALE WET TYPE FLUE GAS DESULFURIZATION DEVICES. *(Chushogata no shisshiki haien datsuryusochi ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):134-136, Jan. 1973.*

A flue gas desulfurization processes for small and medium boilers is described consisting of absorption, oxidation, filtration, and crystallization. During absorption, flue gas is scrubbed with a caustic water solution (a mixture of sodium sulfite, sodium sulfate, and sodium sulfite) for removal of sulfur dioxide, sulfur trioxide, and dust. During oxidation, the absorbent solution is oxidized with air at 5 atm and 100 C so that heavy metals can be filtered out. The sodium sulfate water solution that has absorbed the dust, sulfur oxides, and metals, then becomes a colorless, transparent sodium sulfite water solution which can be discarded or used to recover sodium sulfate crystals. Costs of this system are cited.

30042 **APTIC NO. 52069**

Zeterberg, Joseph M.

A REVIEW OF RESPIRATORY VIROLOGY AND THE SPREAD OF VIRULENT AND POSSIBLY ANTIGENIC VIRUSES VIA AIR CONDITIONING SYSTEMS. PART II. *Ann. Allergy, 31(6):291-299, June 1973. 228 refs.*

Infection and allergy via air handling systems are discussed. In hospitals, laboratories, and buildings in general with closed environments, air handling systems must be engineered to preclude the spread of bacterial, viral, and mycoplasmal disease liberated as aerosols within their confines. The relative sizes of atmospheric particles is presented. Careful design and positioning of air ducts is essential as most air leaving a room is confined to the immediate vicinity of the outlet ducts. Adequate filtration of a building s circulating air volume appears to be the only practical answer to the spread of submicron infective and antigenic material. Electrostatic or high efficiency particulate air (HEPA) filters are recommended for home use. The HEPA filtration of all fresh air will protect against effects of air pollution and pollen induced bronchospasm. The HEPA filtration of all recirculated air is the epidemiological key to halting aerosol transmission of viral induced infection, allergy, and asthma among human hosts sharing a closed environment. The use of HEPA filters in buses, trains, airplanes, and automobiles is suggested.

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30043 **APTIC NO. 52977**

ATMOSPHERIC POLLUTION FROM METALLURGICAL AND ALLIED PROCESSES. *Trans. Soc. Occup. Med., 22(4):130-133, Oct. 1972. (Presented at the Joint Society of Occupational Medicine/BOHS Meeting, Jan. 19, 1972.)*

During the sintering process in the smelting of zinc and lead concentrates, the real pollution problem begins as sulfur is driven off as sulfur dioxide, and zinc, lead, and cadmium are converted to oxides. Sulfur dioxide can be discharged to the atmosphere if the stack height is such that community atmospheric pollution is maintained at a satisfactory level; it can also be converted, at 98% efficiency, to sulfur trioxide, which in turn can be used to provide sulfuric acid. The zinc, lead, and cadmium oxides can be controlled by enclosure, exhaust ventilation, and high-efficiency catchment systems. Wet venturi scrubbers and wet impingement scrubbers can be used to clean exhaust gases. Because of the tendency of toxic materials to accumulate in soil, vegetation, and water, environmental monitoring is recommended.

30044 **APTIC NO. 52225**

THE ZENITH CD FAMILY OF CARBURETTORS. PART 3. EMISSION-CONTROL VARIANTS. *Autocar, 137(3985):26-27, Aug. 31, 1972.*

Zenith Series CD3 and CDSE carburetors are discussed. Designed to meet European emission-control requirements, Series CD3 instruments have an adjustable spring-loaded, biased-type metering needle. The primary function of the adjustment is to cater to small differences existing between supposedly identical instruments. Clockwise rotation of the regulating screw raises the needle assembly and thus enriches the mixture; counter clockwise rotation weakens the datum setting. Series CDSE instruments feature a spring-loaded (biased) metering needle that operates in a pre-set jet. In most cases the needle position is fixed and adjustments in idle-mixture strength are effected by an idle trimmer. Minor changes in mixture strength required by changes in ambient and underhood temperatures are affected by an automatic temperature compensator. High carbon monoxide emissions during high-speed overrun conditions are controlled by a vacuum-actuated throttle by-pass valve.

30045 **APTIC NO. 52143**

Azuma, Hirotaka

DUST LEVEL DETECTOR DEVICE OF A BLAST FURNACE DUST REMOVER. *(Koro jojinki no dasuto reberu kenshutsu sochi). Text in Japanese. (Sumitomo Metal Industries, Co., Osaka (Japan)) Japan. Pat. Sho 47-33893. 3p., Oct. 13, 1972. (Appl. Oct. 20, 1970).*

Carbon and other dusts contained in the exhaust gases of a blast furnace are removed by a dust remover for reuse as a fuel or for analytical purposes. The separated dusts accumulate in the funnel-shaped section of the dust remover, so that they have to be removed from time to time. The dust level detector described tells when to start and end the dust removal operation. Basically a temperature detector, it detects the temperature of the wall of the funnel-shaped section to indicate whether to start or end the dust removal operation, in that the wall temperature is lower when the accumulated dust covers that particular part of the wall. It uses two thermocouples, one installed at a position somewhat lower than the highest allowable dust level and the other installed at a position somewhat higher than the lowest allowable dust level. Each thermocouple is equipped with the temperature detector circuit, a circuit that compares input of the temperature detector circuit with the reference temperature, a relay circuit that operates on the results obtained from the comparison circuit, and a dust level indicator circuit that responds to the relay circuit. When a temperature lower than the reference temperature is detected by the upper thermocouple, the indicator lamp lights up to indicate the need to start removal of the accumulated dust. When a temperature higher than the reference temperature is detected by the lower thermocouple, another indicator lamp lights up to show that the dust removal operation should be stopped.

30046 **APTIC NO. 51971**

Bauerle, G. L., N. T. Thomas, and Ken Nobe

TUNGSTEN BRONZES AND MIXED COBALT OXIDES AS POTENTIAL CATALYSTS FOR POLLUTION CONTROL. *Chem. Eng. J. (Netherlands), 4(2):199-200, Oct. 1972. 5 refs.*

Results of tests on the activity of tungsten bronzes and mixed cobalt oxides catalysts in the reduction of nitric oxide by carbon monoxide and in the oxidation of CO are given. The mixed oxides, copper cobalt oxide and cerium, sodium, and copper tungsten bronzes were tested. The copper and cerium bronzes and the mixed cobalt oxides exhibit good activity for NO reduction by CO and for CO oxidation in air, and merit more detailed studies to determine their feasibility for use in catalytic converters for pollution control of auto exhausts.

30047 **APTIC NO. 52173**

Burdock, Joseph L.

CENTRIFUGAL COLLECTORS CONTROL PARTICULATE EMISSIONS FROM OIL-FIRED BOILERS. *TAPPI, 56(6):78-82, June 1973. 4 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Engineering Conference, New Orleans, La., Oct. 1-5, 1972.)*

Guidance is given on preparing specifications for mechanical centrifugal collectors, one of the devices which can limit the air pollution from the burning of No. 6 residual oil to within acceptable limits. The codes that presently exist and the codes that will be necessary for oil fly ash emission are discussed. The conditions when a mechanical centrifugal collector is applicable are described. The facts pertaining to the burning of No. 6 oil, the use of an additive to control sulfur trioxide formation and maintain boiler efficiency, the need of a built-in water wash system when exit gas temperatures are close to gas dew point, the proved method of collector hopper purging, and the specific steps for the customer to follow in obtaining the best possible collector for his situation are discussed. Experiences to date have proved that properly designed mechanical collectors used for oil fly ash removal can comply with air pollution control codes equal to or better than requirements outlined. (Author abstract modified)

30048 **APTIC NO. 51855**

Campbell, Ivor E. and John D. Ireland

STATUS REPORT ON LIME OR WET LIMESTONE SCRUBBING TO CONTROL SO2 IN STACK GAS. *Eng. Mining J., 173(12):78-85, Dec. 1972.*

Available information on pilot plant and commercial installations using lime or limestone scrubbing for removal of sulfur dioxide from stack gases is summarized. The information includes plant location and capacity, inlet SO2 concentration and removal efficiency; a description of the scrubber system employed; and projected capital and operating costs of commercial prototype installations. Most of the installations were designed for desulfurization of power plant stack gas; however, the results at the TVA Shawnee pilot plant will provide important data for evaluating the applicability of a three-stage turbulent contact absorber to smelter gas control. The extension of pilot scrubbing systems to full commercial scale will require a fuller understanding of process variables and problems of scaling, plugging, erosion, and (to a lesser extent) corrosion. The most significant process variables appear to be slurry solids loading and slurry recirculation rate at a fixed inlet SO2 concentration. High slurry solids loadings increase SO2 removal efficiency but contribute to scaling. Means must also be developed to eliminate entrapped submicron calcium salt particles from scrubber system exhaust gases; and further evaluation is required of problems associated with disposal of the calcium sulfite-sulfate sludge. An empirical or theoretical model must be developed for scale-up of the turbulent contact absorber system to commercial-scale scrubbers.

30049 **APTIC NO. 52234**

Dock, Nils and Lennart Erlesand

GAS WET SCRUBBER. *(Nassabscheider zur Reinigung staubbeladener Gase). Text in German. (Aktiebolaget Svenska Flaektfabriken, Nacka (Sweden)) W. Ger. Pat. 1,546,648. 3p., Nov. 16, 1972. 3 refs. (Appl. Aug. 24, 1965, 1 claim).*

Gas passes down a wide flue to a number of individually parallel channels bounded by a pair of plane converging plates over which the wash liquid flows. At the narrow end of each channel is the throat of a venturi formed by a second pair of diverging plane plates. At the mouth ends of the venturis the plates have adjustable hinged flaps which allow the aperture to be varied in accordance with gas flow rate so that optimum aerosol formation takes place in the throat.

30050 **APTIC NO. 51751**

Gaucher, Leon P.

ENERGY REQUIREMENTS OF THE FUTURE. *Solar Energy, 14(1):5-10, Dec. 1972. 4 refs.*

Within 30-40 years, a large amount of solar energy will be required to supplement nuclear energy and the dwindling supply of fossil fuels. The required amount could be collected and concentrated with satellites and then transmitted to the Earth in concentrated beams of selected wavelengths. The solar beams could then be separated and directed to various processes in large solar energy complexes, e.g., to a photoelectric plant for production of chemicals to store solar energy for other uses, to solar furnaces for the production of heat for processing purposes, and to processes for the production of hydrogen and oxygen for fuel cells in homes or for use in the manufacture of fertilizers, synthetic hydrocarbons, and chemicals. Research work directed toward such a system must be supported by governments and should focus on long distance power transmission, improvements in heat pumps, photochemical reactions, photoelectric converters, catalytic dissociation of water, large satellite solar collectors, and solar spectrum to microwave conversions.

30051 **APTIC NO. 52242**

Gonzales, Don Julian

ELECTROSTATIC DUST COLLECTOR. *(Ionisierungselektroden-Anordnung fuer einen Elektroabscheider). Text in German. (American Air Filter Co. Inc., Louisville, Ky.) W. Ger. Pat. 1,457,257. 6p., June 15, 1972. 7 refs. (Appl. March 8, 1960, 5 claims).*

In this electrostatic dust collector, a pair of support arms are arranged transversely to the direction of gas flow and perpendicular to the plane of the precipitation plates. A pair of transverse members are arranged transversely to the support arms and in the same plane as the precipitation plates. The support arms brace the transverse members against the end plates by flexure. The transverse members are electroconductive and

provided with holes for insertion of a pivot carrying an insulator.

30052 APTIC NO. 52250

Gonzales, Don Julian

ELECTROSTATIC DUST COLLECTOR. *(Elektrostatischer Abscheider). Text in German. (American Air Filter Co. Inc., Louisville, Ky.) W. Ger. Pat. 1,407,496. 8p., June 15, 1972. 10 refs. (Appl. March 8, 1960, 3 claims).*

Numerous design details of this electrostatic dust collector provide a compact, strong construction and simplified assembly. The ionization zone components are arranged to be independent of the collecting zone, and certain holes are provided to permit the assembly of a wire clip into a slot in a mounting bar.

30053 APTIC NO. 52405

Hartman, Miloslav and Robert W. Coughlin

OXIDATION OF SO2 IN A TRICKLE-BED REACTOR PACKED WITH CARBON. *Chem. Eng. Sci., 27(5):867-880, May 1972. 17 refs.*

The steady-state, continuous, counter current contacting of sulfur dioxide-bearing air with water in a column packed with carbon was modeled by combining the classical treatment for gas absorption with expressions for the rate of transport through the liquid and for the rate of catalytic oxidation of SO2 within the porous carbon. This process is closely related to schemes which have been developed for the commercial desulfurization of flue gas. Steady-state experiments were carried out in a small trickle-bed reactor, 31.5 mm in diameter packed with carbon pellets of average size 4.5 by 5.7 mm to a depth of 10 cm. Mass transfer coefficients were estimated from correlations, and effective reaction rate relations were developed from experiments conducted in well-stirred vessels. Using these parameters and treating the wetted fraction of the carbon external surface area as an adjustable parameter, good agreement between model and experiment was obtained. Sulfuric acid can be obtained as the end-product of this reaction and can be recovered. (Author abstract modified)

30054 APTIC NO. 52481

Hashimoto, Kazuo and Hirokazu Nakamura

THE DODGE COLT ENGINE AND RELATED ENGINES. *Mitsubishi Juko Giho (Mitsubishi Heavy Ind., Tech. Rev.), 9(3):1-10, Oct. 1972. 1 ref.*

The design features of the four-cylinder, overhead camshaft 1.6 liter Dodge Colt engine and of four other single and double overhead camshaft engines in the same family are presented. The engines were developed for high performance with a compact size and reduced weight. The Dodge Colt engine in particular, was designed to be in compliance with 1972 emission standards. Design objectives are reviewed, and reduced maintenance costs, noise reduction, and the emission control system are discussed. The emission controls achieved with this engine, such as improved combustion chamber design of small surface/volume ratio and the various control systems, including ignition and valve timing, a crankcase ventilation system, and fuel evaporative emission controls, are described in detail.

30055 APTIC NO. 52111

Hashizume, Minoru

EXHAUST GAS. 4. PRINCIPLE AND PRACTICE OF LABORATORY HOOD DESIGN. *(Kenkyushitsu yo fudo settsukei no genri to jittsusai). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(12):1655-1663, Dec. 1972. 21 refs.*

The design of a laboratory hood is described. It is more effective to exhaust concentrated gases through the hood immediately than to exhaust the dispersed gases through ventilation. A system consisting of a main hood, branched duct, main dust, dust collector, fan, an venting outlet is described. The determination of the exhaust velocity of the hood to prevent the excape of pollutants is illustrated. Enclosure (booth), exterior, and receiving type hoods are described. The enclosure hood is the most effective method for cleaning laboratory air. Air cleaning capacity for the enclosure hood equals the dimensions of the hood opening times the exhaust velocity of the hood. Exhaust velocity must be 50-100 ft/min for harmless pollutants and 125-200 ft/min for harmful pollutants.

30056 APTIC NO. 52470

Hayashi, Kenzo

FILTER DEVICE FOR AIR CONTAINING FINE DUST OR ATOMIZED PAINT PARTICULATES. *(Bijin matawa toryo muka biryushi to o fukumu kiryu no rokasochi). Text in Japanese. (Tokiwa Denki Co., Ltd., Kakumubara (Japan)) Japan. Pat. Sho 47-33901. 3p., Oct. 13, 1972. (Appl. Dec. 9, 1970).*

The filter device is composed of several filter boards installed at a right angle to the air flow direction or paint spray direction. The filter boards are properly spaced from one another and held in place between the upper and lower rails fitted to the upper and lower frames. The filter board is made of suitable filter materials wrapped in a flat structure of the fine-meshed wire nettings. Such filter materials as may be suitable according to the use. For example, glass wool, chemical fibers, or felt are used for filtration of air dust in coal mine and cement manufacturing factories. The first filter board located closest to the intake side is provided with air inlet holes distributed proportionately throughout the entire surface area of the filter. The second is provided with inlet holes numbering a third of those of the first, the hole diameter is smaller if necessary. The third is provided with inlet holes numbering half those of the second, the hole diameter is smaller if necessary. When air is sucked by a suction device placed behind the third filter board, it is first filtered by the first filter board. Those dust or paint particulates not arrested by the first filter flow together with the air through the inlet holes toward the second filter board and are arrested on it. Those particulates still uncollected at the first and second stages are arrested by the third filter board. The flow speed will be constant throughout all stages of filtration due to the inlet holes properly provided.

30057 APTIC NO. 52090

Hirayama, Naomichi

THE FUTURE URBAN WASTE INCINERATORS FROM THE STANDPOINT OF HYDROGEN CHLORIDE GAS COUNTERMEASURES. *(Enka suiso gasu taisaku kara mita kongo no toshi gomi shokyakuro no arikata). Text in Japanese. In: Report on the Studies of Control Measures for Hydrogen Chloride Gas from Waste Incineration, 1971. Japan Public Health Assoc., p. 55-59, March 1972.*

Treatment techniques for stack gases of municipal incinerators, and the future trends for incinerators are discussed. The emission standard for hydrogen chloride concentration in the stack gas of urban incinerators should be, for the time being, approximately 300 ppm. With this level of concentration, high stacks can disperse toxic gas enough to lower concentration much below the environmental standard. New gas treatment facilities are still in the stage of experiments, and time is needed for developing effective gas treatment systems. For incineration of urban refuse, plastics should be selectively collected, and HCl gas concentration should be controlled under 1000 ppm at any time. For the present, the multi-level scrubber is most practical for urban incinerator stack gas treatment, but the treatment of waste water will require will require some device. The remodeling of the water spray gas cooling system used for an ordinary incinerator for an additional function of gas absorption should be simple enough. In this case also, the treatment of waste water is necessary.

30058 **APTIC NO. 52131**

Homma, Katsunori

EXHAUST GAS. 6. DESIGN AND MAINTENANCE OF CLEAN ROOMS. *(Kurin rumu no sekkei to hoshu kanri). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(12):1668-1680, Dec. 1972. 6 refs.*

The design and maintenance of clean rooms and the origin of pollution are described. Air in analysis rooms must be kept clean to prevent errors in measuring from interfering gases. Particulates are emitted by boilers, motor vehicles, and other sources. The maximum allowable particulate concentrations in clean rooms must be determined from the purpose of the room. Particulated concentrations in the room are determined by the outside particulate concentration, amounts of incoming air, air circulation rate, and circulating air. Filter trapping, adhesion trapping, digital, and electronic bulb counting dust meters are used for measuring dust concentrations. Standard sampling and maintenance methods are described.

30059 **APTIC NO. 52024**

Ito, Tojiro, Isamu Oishi, Yukio Ishigaki, Tadashi Tatsumi, and Azuma, Negira

INVESTIGATION ON WASTE PRODUCTION FROM PLYWOOD AND LUMBER INDUSTRIAL AGGREGATION, REPORT NO. 1. *(Goban oyobi seizai danchi no haizai jittai chosa ni tsuite, daiippo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(10):438, Oct. 1972.*

An investigation was conducted on the waste treatment and disposal method for plywood and lumber industrial aggregate in the Sumiyoshi District of Osaka, where citizens have complained of air pollution by sulfur oxides, dusts, smoke, and bad odor. A questionnaire was distributed to 79 plywood and lumber plants between Sept. and Oct. 1971, and a 63.3% response was obtained. The total fuel consumption for 14 plywood plant boilers was 7000 l/hr, and for 65 lumber yard incinerators was 1440 l/hr. Ash production from plywood industries was 21,000 kg/mo and from lumber yards was 720 kg/mo. Ashes and cinders are treated by private disposal business operators. Soot and dust elimination equipment included 14 cyclones for plywood plants, and 10 wet dust collectors for lumber yards; 26 lumber yards had no dust collectors. The future administrative policy of the municipal government concerning these industries includes recommendations and guidance for low sulfur fuels and the installation of stack gas desulfurization systems and dust collection systems.

30060 **APTIC NO. 52142**

Kano, Yoshihisa and Masaoki Takahashi

BLAST FURNACE GAS PURIFICATION DEVICE. *(Korogasu seijo sochi). Text in Japanese. (Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 47-33894. 4p., Oct. 13, 1972. (Appl. June 12, 1970).*

A dry type dust collector is described which is connected to the downward ducts of a blast furnace exhaust system. With dry dust collectors, the separated dust can deposit on the internal walls of the collector due to water condensation and due to steam injected into the collectors; thus, the collectors must be cleaned by removing the deposited dust to maintain high dust removal efficiency. In conventional systems, the blast furnace operation had to be suspended for this cleaning. Dangerous blast-out of the gas was experienced with the conventional system because the seal fitted in the dust discharge section had become damaged with dust. The new system described in this invention prevents the danger of blast-out and permits cleaning of the dust collectors while the blast furnace is operating. The dust collector is connected to each branch pipe from the downward duct of the blast furnace. The branch pipe is provided with a control valve and a pressure release valve. To remove the accumulated dust, the control valve of the horizontal pipeline connecting the upper sides of the two dust collectors is closed and the control valve of the branch pipe is closed. Both the pressure release valves of the branch pipe and the horizontal pipeline are opened to reduce the pressure level in the dust collector and draw the dust from the collector. Several sets of dust collectors are installed in the blast furnace, so that one set can be cleaned while the others are operating.

30061 **APTIC NO. 52248**

Karr, C., Jr., R. V. Rahfuse, and P. F. Langdon

REACTIONS OF IRON SULPHIDES IN SIMULATED STACK GASES. *J. Appl. Chem. Biotechnol., 22(5):613-622, May 1972. 4 refs.*

The rates of production and comsumption of sulfur dioxide by the reactions of oxygen, SO_2, and mixtures of O_2 and SO_2 in simulated stack gas in a system in which fixed and fluidized beds of iron sulfide prepared from pyrite were processed with stack gas to recover iron oxides and sulfur and remove SO_2 were determined over the temperature range 800-950 C. The rates of production of SO_2 by reaction of iron oxide with FeS in different gas systems were also determined. The rate of reaction of SO_2 with FeS was controlled by diffusion in the pores of a surface coating, probably an iron oxide, while the rate of reaction of O_2 with FeS was controlled by diffusion in the bed. Under conditions of low input rates of either SO_2 or O_2 with regard to the weight of the FeS bed, a steady state for the consumption or production of SO_2 could be obtained. The reaction rate of O_2 with a given weight of FeS was essentially the same for a fixed bed and a fluidized bed, but the reaction rate of SO_2 with a given weight of FeS was nearly seven times greater in a fluidized bed than in a fixed bed. When input gases contained both SO_2 and O_2, the competing reactions of consumption and production of SO_2 proceeded independently of eath other. The rate of production of SO_2 from the reaction of Fe_2O_3 with FeS was independent of the partial pressure of SO_2, and dependent on the temperature. (Author abstract modified)

30062 **APTIC NO. 52128**

Kobayashi, Yoshitaka

EXHAUST GAS. 1, SAFETY MEASURES FOR INORGANIC GASES. *(Haigasu. 1, mukigasu no anzen taisaku). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(11):1530-1539, Nov. 1972. 13 refs.*

Inorganic gas safety measures, maximum allowable concentrations, rescue methods and emergency treatments, and inorganic gas disasters are discussed. Explosions and poisoning can occur because of inorganic gases. Poisoning can occur through the respiratory system, the digestive system, and skin. Acute and chronic maximum allowable concentrations are discussed. Measurement methods, ventilation, and control methods are described.

30063 **APTIC NO. 52404**

Krasuk, J. H. and J. M. Smith

KINETICS OF REDUCTION OF NICKEL OXIDE WITH CO. *Am. Inst. Chem. Engrs. J., 18(3):506-512, May 1972. 19 refs.*

Initial rates were measured for the reduction of single pellets of nickel oxide with carbon monoxide at atmospheric pressure and temperatures from 566 to 796 C. The nickel oxide pellets were porous, and intrapellet diffusion retarded the rate so that the shrinking core model was not applicable. Effective diffusivities for the lower porosity pellets were very small. The reaction appeared to be first order in carbon monoxide. Rate constants, based upon the intraparticle area, indicated an activation energy of 47 kcal/g/mole over the temperature range 566 to 682 C. At higher temperatures the rate was constant. These results, while not conclusive, are in agreement with a reaction sequence consisting of formation of nuclei of nickel atoms in the nickel oxide surface, rapid adsorption of carbon monoxide at the nickel-nickel oxide interface, migration of the adsorbed carbon monoxide to the adjacent lattice, and a slow reaction to extract oxygen from the lattice. (Author abstract modified)

30064 **APTIC NO. 52118**

Kurihara, Mitsuo

EXHAUST GAS RECIRCULATION NITROGEN OXIDES CONTROL DEVICE FOR DIESEL ENGINES. *(Diizeru enjin haikigasu junkanshiki chissosankabutsu yokusei sochi). Text in Japanese. (Tokyo Filter Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 47-33077. 2p., Oct. 5, 1972. (Appl. Nov. 16, 1970).*

An exhaust gas recirculation (EGR) cleaner to reduce nitrogen oxides from a diesel engine and to remove soot and other particles from the exhaust gas is described. It consists of a strut type cyclone unit equipped with a cyclone vane, and oil-filled filter unit, another filter unit, a counterflow check valve, and a flow quantity control valve. The soot and other particles separated by the cyclones are led into the oil-filled filter unit where they are removed. The exhaust gas is further cleaned with another filter unit; the gas then goes into the check valve and the control valve which regulates the quantity of the exhaust gas to be fed back into the engine.

30065 **APTIC NO. 52252**

Laakso, Oliver Armas

RECOVERY OF HEAT FROM THE BLACK LIQUOR OF A DIGESTER BY FLASH EVAPORATION. *(Verfahren und Vorrichtung zur Waermerueckgewinnung aus der Schwarzlauge eines Zellstoffkochers durch Entspannungsverdampfung). Text in German. (Aktiebolaget Kamyr, Karlstad (Sweden)) W. Ger. Pat. 1,692,823. 7p., Feb. 3, 1972. (Appl. June 21, 1966, 6 claims).*

Black liquor from wood pulping is concentrated by flash distillation in a series of evaporation tanks which are operated at successively lower pressures, and contain heat exchangers to transfer heat from the distillate to the liquor in the evaporation tanks. Compared with other apparatuses used to cool and concentrate black liquors, this apparatus uses heat more efficiently and gives liquors having a higher solids content and lower temperature.

30066 **APTIC NO. 52127**

Makimura, Hiroyuki and Tetsunori Yamamoto

EXHAUST GAS. 2. HANDLING OF RARE GASES. *(Kigasu no toriatsukai). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(11):1540-1551, Nov. 1972. 20 refs.*

Characteristics, preparation and purification, analysis, and handling of rare gases are discussed. Various methods for purifying rare gases by elimination of oxygen, water, carbon dioxide, carbon monoxide, hydrocarbons, and hydrogen using chemical adsorption, absorption, and so on are discussed. Analytical methods include gas chromatography, mass spectroscopy, infrared and ultraviolet spectrometry, and chemical methods.

30067 **APTIC NO. 52268**

Margraf, Adolf

FILTER BAGS. *(Taschenfilter zum Reinigen von Staubgas). Text in German. (Heinrich Luehr VDI Staubtechnik (West Germany)) W. Ger. Pat. 1,929,312. 4p., June 22, 1972. 5 refs. (Appl. June 10, 1969, 3 claims).*

Filter bags for cleaning gas polluted with dust are described. Parallel filter bags are disposed in the impure gas compartment of a filter chamber, their opening edges being secured in tightly sealed relationship to a slit wall dividing the two chambers containing impure and pure gas. The filter material surfaces of the bags are kept apart by frames tensioned by a coil spring mat and inserted via the slits and a door on the pure gas side of the filter. Z-shapes are provided between the slits on the clean gas side. The Z-shapes form a plane over which a nozzle moves back and forth for countercurrent injection of gas for dust cleaning of the filters.

30068 **APTIC NO. 52137**

Matsuzawa, Kenji

AIR POLLUTION PREVENTION DEVICE FOR AUTOMOBILE. *(Jidoshayo taikiosen boshi sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 47-33048. 6p., Oct. 5, 1972. (Appl. Dec. 6, 1967).*

An air injection exhaust gas cleaner for automobiles is described in which compressed air is injected into the exhaust manifold for recombustion of combustibles contained in the exhaust gas. In conventional systems, the alternator and air pump are each a separate unit driven by a separate drive belt and pulley mounted on the engine shaft. This system thus requires more belts and pulleys. Another disadvantage is that the alternator needs a cooling fan to cool itself while the compressed air fed by the air pump is not warm enough to encourage effective recombustion of the exhaust gas. In the new system the alternator and air pump are connected in series and combined into the unit, thus requiring only one transmission system to drive both. Another advantage is that the compressed air generated by the air pump is first fed into the alternator for circulation, thereby cooling the alternator and heating the air at the same time. The compressed air so heated is injected into the exhaust manifold for effective recombustion of combustibles in the exhaust.

30069 **APTIC NO. 52117**

Miura, Mitsugu

EQUIPMENT FOR REMOVING DUST AND POISONOUS GASES IN EXHAUST GAS. *(Gasuchu no funjin, yoshorigasu o bunri suru sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-44906. 6p., Nov. 13, 1972. (Appl. Nov. 22, 1968, 2 claims).*

A device is described in which dust, sulfur dioxide, nitric acid, odors, and other toxic gases contained in exhaust gas are removed by catalytic reaction with filmy liquid on the walls of a cylinder. The dust-containing liquid and the reaction product-containing liquid droplets are formed into filmy liquids by centrifugal flow inside the contacting room and again reacted with the exhaust gas. The dust and toxic gases are then separated out and dried into solids which are discharged through the cylinder.

30070 **APTIC NO. 52260**

Morabito, Bruno and William T. Lyons

ECOLOGY, ENERGY, AND ECONOMY. *Heating, Piping, Air Conditioning, 44(2):51-57, Feb. 1972.*

In meeting the environmental challenges of today, the air conditioning designer s main responsibility is energy conservation, which benefits ecology and economy at the same time. The three main factors associated with air conditioning and refrigeration systems that contribute directly or indirectly to pollution are heat dissipation, equipment noise, and power generation for electrically driven equipment; pollution can be minimized by minimizing the energy involved. Of cooling towers, evaporative condensers, and the air-cooled condenser, the air-cooled condenser, the latter are probably the most wasteful power resource. Low-grade energy--building load produced by lights, people, machinery, outdoor air brought into the building in summer, and the air exhausted from it in winter--can be harnessed to reduce the strain on energy-supply utilities. Careful air conditioning system selection and choice of building design and equipment design and arrangement are effective in reducing power consumption. The variable volume air conditioning system takes full advantage of load diversity and contributes to a significant reduction in capital and operating costs.

30071 **APTIC NO. 52358**

Motonaga, Yasuyuki

NITROGEN OXIDES IN STATIONARY COMBUSTION DEVICES. *(Kotei nenshosochi no okeru chissosankabutsu). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 14(6):293-301, Dec. 1972. 13 refs.*

Oxides of nitrogen including nitric oxide and nitrogen dioxide can cause photochemical smog when acted upon by ultraviolet radiation. About 60% of the total atmospheric NOx comes from stationary sources. The U. S. environmental standard is 0.05 ppm NO2 as the annual average; the USSR standard is 0.045 ppm for 24-hour average. Reduction of nitrogen content in fuel does not result in a drastic NOx reduction, since heavy fuel oil generally contains only 0.1-0.3 wt%. Nevertheless, the use of natural gas containing practically no N2 is effective for NOx reduction. Combustion control methods are the most effective control methods; these include exhaust gas recirculation, low excess air combustion, two-stage combustion, and water and steam injection. Scrubbing, absorption, and catalytic reduction also reduce NOx.

30072 **APTIC NO. 52373**

Nelson, W. L.

QUESTIONS ON TECHNOLOGY/REFINERY POLLUTION CONTROL. *Oil Gas J., 70(36):86, Sept, 4, 1972. 21 refs.*

Complexity factors for refineries will have to include elaborate water treatment equipment to safeguard against leaks or to recover oil from leaks, special storage facilities to stop pollution by hydrocarbon vapors, and some changes to eliminate sulfur dioxide in refinery flue gases. Some of the costs of eliminating sulfur will appear automatically in the regular complexity factor. Fuel oils or stack gases must be desulfurized. Likewise, regenerator flue gas or the feed to catalytic cracking must be desulfurized. Finally, the waste gases from sulfur-recovery plants must be purified more completely than in the past. These requirements will increase total refinery complexity by about 8.5% which increases the cost of the refinery by about 7.6%. Reported pollution-control costs for refineries are about 8.3% of the regular cost of refineries; actual costs and estimates vary from 1.7-7.4%.

30073 **APTIC NO. 51837**

Nobles, E. J., M. Van Sickels, and S. Crossland

THE CRG PROCESS FOR SNG. *Chem. Eng. Progr., 68(12):39-44, Dec. 1972.*

The second generation adaptation of the British Gas Council Catalytic Rich Gas (CRG) process provides pollution-free methane that is completely compatible and interchangeable with transmission quality natural gas. Like the Lurgi and Japanese Gasoline processes, the CRG process is based on the catalytic conversion of hydrocarbon feedstocks varying from ethane to heavy naphthas in an adiabatic reactor. To protect the activity of the low-temperature CRG reforming catalyst, feedstock is desulfurized by the Stretford process which allows full recovery (99.9% +) of sulfur in elemental molten form. The sulfur is transferred by hose from the recovery tank to transports without dusting or odor nuisance. Production costs with this pollution-free concept are almost identifical with those of designs that used solid absorbents, have only partial sulfur recovery, or use a sulfur-containing fuel. Total and unit costs of the CRG process are detailed for 40, 100, and 250 million std cu ft/day plants.

30074 **APTIC NO. 52089**

Oda, Takeshi

TECHNICAL DEVELOPMENT FOR URBAN WASTE INCINERATORS FROM THE STANDPOINT OF HYDROGEN CHLORIDE GAS COUNTERMEASURES. *(Enka suiso gasu taisaku kara mita toshi gomi shokyakuro no gijutsu kaihatsu). Text in Japanese. In: Report on the Studies of Control Measures for Hydrogen Chloride Gas from Waste Incineration, 1971. Japan Public Health Assoc., p. 46-54, March 1972.*

About 100 ppm concentration of hydrogen chloride inhaled for a period of time will produce prolonged health impairment, and 1000 ppm of HCl will result in death in 30-60 min. When polyvinyl chloride alone is incinerated, the HCl concentration in combustion gas reaches 30,000 ppm. In the case of some municipal waste incinerators, the combustion gas HCl concentration has reached 1000 ppm. Most city incinerators are preventing air pollution by HCl by increasing the stack height more for better air dispersion of toxic gas. Various HCl elimination methods are compared. The dust collector plus spray method has the advantages of simple installation and easy air diffusion, but also has disadvantages such as a relatively low elimination rate and a need for liquid waste treatment. Venturi scrubbers are excellent for gas elimination and dust collection, but require much water and liquid waste treatment. An effective detoxitizing method of lime additive, developed in Sweden, is simple to install and air diffusion is easy; but it is still in the process of experiment, and the lime consumption is considerable. Dust collectors with ammonia additive is simple to install and also advantageous for air dispersion, but ammonia consumption can be expensive. Better results for HCl are obtained if the combustion gas temperature is low, but this may sometimes create white smoke from the stack if wet scrubber or packed tower is used.

30075 **APTIC NO. 52129**

Odera, Akira, Tetsuo Nishizaki, and Kazuni Fukunaga

A METHOD OF MANUFACTURING AN ADSORBENT WITH AN ACTIVATED CARBON. *(Takoshitsu kizai ni kasseitan o fuchaku saseta kyudacchakutai no seizoho). Text in Japanese. (Kurare Co., Ltd., Kurashiki (Japan)) Japan. Pat. Sho 47-44153. 4p., Nov. 8, 1972. (Appl. July 30, 1969, 1 claim).*

A method of manufacturing an adsorbent having excellent adsorbent and desorbent properties is described. The adsorbent is manufactured by a method in which powdered activated carbon is adhered to a porous base, thus producing an adsorbent with good gas penetrating power and good adsorptive and desorptive powers. The activated carbon is of less than 60 mesh size and the pores are 10-100 Angstrom in diameter. Adhesive is sprayed over a base having a three-dimensional porous structure, and the activated carbon is then applied to the base.

30076 **APTIC NO. 52469**

Ozawa, Akio

DISPOSAL DEVICE OF WASTE GAS CONTAINING POWDER DUST. *(Funjinganyu haigasu shorisochi). Text in Japanese. (Nippon Kogei Kogyo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 47-33903. 3p., Oct. 13, 1972. (Appl. Nov. 6, 1970).*

This device is designed to effectively remove powder dust such as ceramic and coke ash and harmful gases such as sulfur dioxide and carbon monoxide contained in the waste gas emitted from cupolas, electric furnaces, or open-hearth furnaces. The dust comes in various particle sizes widely ranging from 0.1 to 300 micron. This disposal device has been designed to meet this wide-ranging requirement for removal of such powder dust. This cleaner is a tubular unit wider in diameter than the exhaust duct of the cupola and attached to the top-end portion of the exhaust duct. The tubular unit is roughly divided horizontally into three main compartments. The upper compartment is a water or scrubbing liquor tank, the middle compartment a scrubbing section, and the lower compartment a water or scrubbing liquor receiving tank. In the middle compartment are two or more concentric tubes of wire nettings. Water or scrubbing liquor in the tank above flows down onto these wire tubes and forms water membranes in their meshes. It also flows along the internal wall of the middle compartment. The exhaust duct of the cupola opens in the middle compartment. As the waste gas flows into the middle compartment, it eventually changes its flow direction from vertical to horizontal because of the pressure increase resulting from the continuous in-flow of the gas. As the waste gas flows through the water membranes of the concentric tubes, it is cleaned. The cleaned gas flows out of the middle compartment through the discharge port provided there. The waste gas if of such a high pressure that the dust contained in it often breaks the water membranes without being collected. In such a case, the dust is arrested by the water or scrubbing liquor flowing along the internal wall as it hits that wall. The used water or scrubbing liquor is collected in the water receiving tank and recirculated after being properly cleaned.

30077 **APTIC NO. 52233**

Pearce, Thomas, James Perrett, and William Stannage

DESULFURIZING HYDROCARBONS IN SEVERAL STAGES. *(Verfahren zur Entschwefelung von Kohlenwasserstoffen in mehreren Stufen). Text in German. (Imperial Chemical Industries Ltd., London (England)) W. Ger. Pat. 1,420,884. 4p., Oct. 5, 1972. 11 refs. (Appl. Aug. 21, 1959, 4 claims).*

In a multistage process for desulfurization of a hydrocarbon free from ethylenically or acetylenically unsaturated compounds, the hydrocarbon is first treated with sulfuric acid above 40 C, the hydrocarbon and acid separated, and the hydrocarbon vaporized; or the untreated hydrocarbon is vaporized directly and the vapors led at 350-450 C and 1-50 atm over a contact material containing zinc oxide, manganese oxide, or iron oxide. In a second stage, the vapors are led with hydrogen at 350-450 C and 1-50 atm over a known hydrogenating desulfurization catalyst. In a third stage, the hot vapors are treated with ZnO, manganese oxide, or iron oxide, to absorb hydrogen sulfide. Sulfur contents greater than 0.0005% can be reached. The hot mix of desulfurized hydrocarbon vapor and H2 can be mixed with steam and reformed to give a methanol synthesis gas.

30078 **APTIC NO. 52235**

Quesnel, Guy

DEODORIZING VAPORS ARISING FROM THE REMOVAL OF CLARIFICATION SLUDGE BY DRYING AND BURNING. *(Verfahren zur Desodorisierung von bei der Beseitigung von Klaerschlamm durch Trocknen und Verbrennen entstehenden Brueden sowie Vorrichtung zur Durchfuehrung des Verfahrens). Text in German. (Stein Industrie, S. A. Paris (France)) W. Ger. Pat. 1,908,612. 4p., June 8, 1972. 1 ref. (Appl. Feb. 21, 1969, 3 claims).*

Raw, moist clarification sludge is dried and burned in a rotary drum drier by introduction of hot gases at 700-800 deg through a connecting pipe, and the odorous vapors are conducted through a heat exchanger by a piping system to a point in the piping connecting the upper chamber of a cyclone combustion furnace to the connecting pipe. The furnace is supplied with heat combustion air passing through a second heat exchanger, and the gases leaving the combustion furnace at 1400-1600 deg are mixed with vapor to provide the mixed gases at 700-800 deg to the drum drier at the connecting pipe. Part of the mixed gases continue their passage through the piping system, the heat exchangers, and a dust collector prior to emission to outside air. The long passage through the piping system at 1600-1700 deg serves to deodorize the vapors.

30079 **APTIC NO. 52400**

Rivers, Richard Douglas and Delose Holloway Robb

ELECTROSTATIC PRECIPITATOR PLATE HOLDER. *(Elektrostatisches Luftfilter). Text in German. (American Air Filter Co., Inc., Louisville, Ky.) W. Ger. Pat. 1,407,024. 4p., Nov. 30, 1972. 7 refs. (Appl. Nov. 17, 1958, 2 claims).*

An electrostatic precipitator plate holder, particularly for air cleaning, seals and connects slide-in plates reliably. In electrostatic cleaners, slide-in electrode plates positioned across the flow are sealed, and self-contact is obtained independent of manufactured tolerances or housing distortions by guide channels formed by holders welded along precipitator top and bottom housing. The basic holder part is generally U-shaped with the legs inclined outwards parallel with the V inclination of each pair of electrode frames, of which the top and bottom corners rest against an inward protruding notch along the U-legs close to their base, thus creating a space between the U-legs and electrode frame sides accommodating the individual horizontal electrical spring contacts to each electrode frame. All live electrical connections are on the precipitator outlet end, only the spring contacts along this end are insulated by an insulating material block attached to a carrier welded to the U-legs. The guide channel is completed by angles welded back to back and along the middle of the U-base with continuous sealing strips held in between, the base of the double angle are partially recessed for this purpose. The inside electrode frame corners are located by the angle uprights with the sealing strips resting against the electrode frame tops and bottoms.

30080 **APTIC NO. 52228**

Shah, K. S. and K. Vikram Rostogi

AIR POLLUTION BY AIRCRAFT GAS TURBINES. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 275-280. 8 refs. (May 15-18.)*

Aircraft gas turbine exhaust consists mainly of smoke and nitrogen oxides, hydrocarbons, carbon monoxide, and smaller amounts of carbon dioxide, sulfur oxides, aldehydes, and aerosols. Pollutant concentrations are markedly affected by engine speed, air/fuel ratio, overall pressure ratio, fuel spray cone angle, droplet mean diameter, combustion chamber surface area and volume, and cooling air flow. The type of fuel used is also of great significance. As a result of changes in combustion chamber design (including air-spray fuel injectors) and premix systems, new large transport engines will have barely visible smoke emissions. Annular combustion chambers are advantageous because of smaller flame tube wall surface area, and lower unburned hydrocarbon and carbon monoxide concentrations considerably. Nitrogen oxides formation is still difficult to control, but emissions are substantially less than the levels prescribed for automobiles.

30081 **APTIC NO. 51911**

Shishu, Ramesh Chandra

KINETICS OF CO OXIDATION OVER PT CATALYST. *Detroit Univ., Mich., Dept. of Chemical Engineering. Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 170p. 70 refs.*

The kinetics of carbon monoxide oxidation over a platinum catalyt were investigated. Data on rates of CO catalytic oxidation were obtained using a differential flow reactor operated at atmospheric pressure and in the temperature range 450-800 F. The rate data were correlated by a mathematical model based on the dual-site mechanism in which the rate controlling step is a surface reaction between adjacently adsorbed CO and oxygen molecules. The validity of the model was tested for a nonisothermal packed-bed reactor. A two-dimensional mathematical model consisting of mass and heat balances in the radial and longitudinal direction, coupled with a rate model, was developed and successfully predicted measured temperatures and conversions. Catalytic oxidation can be used to control ex-

hausts from cars in a catalytic afterburner. (Author abstract modified)

30082 **APTIC NO. 52497**

Sonoda, Kiyoko

POLLUTED GAS CLEANER. *(Osengasu seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-33902. 2p., Oct. 13, 1972. (Appl. June 11, 1970).*

A scrubber type for flue gas purification is described featuring a simple design. The main casing is a box-like structure. In the box are three vertical shafts proportionately spaced from one another. The left and right shafts are each provided with a spiral brush of identical specifications. The center shaft is also provided with a similar spiral brush which is diametrically opposite to the other two only in the direction of the S-curve of the brush. These three brushes are chain-driven and linked to the motor by the same drive chain in such a way that the left and right shafts may turn in the same direction while the center shaft turns in the opposite direction. The brushes are installed in such a way that their most extruded parts may contact with each other and with the internal wall of the main casing. The gas intake port is provided near the bottom of the main casing, while the gas discharge port is in the upper half. The scrubbing liquor is injected from the top side and retained inside of the main casing to some height so that the lower parts of the brushes may be dipped in the liquor. The gas taken into this cleaner is sufficiently contacted with the scrubbing liquor, absorbed and sprayed by the brushes, and thus effectively scrubbed for removal of soots and neutralization of harmful chemicals. Since the brushes touch the internal wall and clean it as they revolve, the internal wall is always kept clean and free from possible accumulation of the dust.

30083 **APTIC NO. 52240**

Sponsel, Kurt

FILTER OF FOAMED PLASTIC FOR REMOVING VAPORS, SMOKE, AND CONTAMINATING GASES FROM THE AIR. *(Filter zum Entfernen von Daempfen, Rauch und Fremdgasen aus der Luft). Text in German. (Collo Rheincolldoium Koeln G.m.b.H (West Germany), Werk Hersel) W. Ger. Pat. 1,794,285. 2p., June 8, 1972. (Appl. March 7, 1964, 2 claims).*

The open cell hydrophilic plastic foam filters contain a catalytically active redox system united by the use of a hydrophilic methyl cellulose bonding material. Six parts manganese hydroxide and four parts copper oxide kept for a long time in 33 parts 4.5% methyl cellulose solution and diluted with 66 parts styrene-butadiene dispersion and sufficient alkaline water containing a trace of ammonium hydroxide, produce a thin paint. A thick open cell plastic foam plate is drawn through this dispersion, the surplus squeezed out, and the plate dried to give a filter for use in moist alkaline conditions.

30084 **APTIC NO. 52367**

Stolfa, Frank

DESULFURISING S-CONTAINING HIGH BOILING FEEDSTOCK. *(Verfahren zur Umwandling und Entschwefelung eines schwefelhaltigen Kohlenwasserstoffeinsatzmaterials). Text in German. (Universal Oil Products Co., Des Plaines, Ill.) W. Ger. Pat. 1,954,002. 9p., June 22, 1972. 2 refs. (Appl. Oct. 27, 1969, 6 claims).*

Desulfurization of sulfur-containing high boiling feedstock is described. The feedstock is heated from 260 deg C to 399 deg C and passed to a catalytic reaction zone and reacted with hydrogen at more than 68 atm. The reaction product passes to a first separation zone at the same pressure and it separated into vapor and liquid phases. The first vapor phase is separated at the same pressure, but at lower temperatures into H2-rich second vapor and liquid phases. At least a part of the first liquid phase is thermally cracked.

30085 **APTIC NO. 52088**

Takatsuki, Gen

TOXIC GAS ELIMINATION MEASURES FOR WASTE INCINERATORS. *(Gomi shokyakuro kara no yugai gasu jokyo taisaku). Text in Japanese. In: Reports on the Studies of Control Measures for Hydrogen Chloride Gas from Waste Incineration, 1971. Japan Public Health Assoc., p. 30-45, 16 refs. March 1972.*

Toxic gases emitted from incinerators of urban waste are hydrogen chloride, nitrogen oxide, and hydrocarbons. Various methods of elimination of these gases are discussed. Spray towers, packed towers, multiple level towers, and bubble towers are explained with diagrams. The degrees of corrosion of material are examined. These gas treatment systems for city incinerators are still in the stages of laboratory experiments or pilot plants in Japan. Further studies and experiments are required. By experiments, it was found that 100-200 ppm NOx was produced when ammonia gas was burned at 850 C. Hydrocarbons found in the experiment of urban waste combustion were: n-butane, isopentane, N-pentane, 2-methypentane, 3-methylpentane, N-hexane, methylcyclo-pentane, s-methylhexane, N-heptane, cyclohexane, and benzene. Benzene was found in great quantity. In the incineration experiment of polyethylene waste, benzene was 1.5-2 wt% of the weight of polyethylene. Fly ash and cinder samplings were taken from a municipal incinerator, and heavy metal contents were measured by atomic absorption spectrophotometry. Relatively high percentages of iron, lead, copper, and zinc were found, and small amounts of chromium, manganese, and cadium were detected. The Cd in fly ash was about 4-7 times the Cd content in cinder. This is due to the low boiling point of Cd and the early gasification.

30086 **APTIC NO. 52120**

Tamura, Shohei

EXHAUST GAS. 5. DRAFT CHAMBER AND EXHAUST GAS HANDLING. *(Dorafuto chanba to haigasu shori). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(12):1663-1668, Dec. 1972. 2 refs.*

A draft chamber and exhaust gas handling system is described. Conventional draft chambers are usually covered with a lead sheet to resist sulfuric acid corrosion; however, recently hydrochloric acid has been used, which can corrode the lead and cause air pollution. Exhaust gases should be scrubbed during their passage through the duct. Plastics should be used in the construction of the draft chamber instead of lead or stainless steel. The wasty water from the chamber contains various heavy metals, acids, and organic solvents, and therefore must be cleaned before entering an aeration tank. Installations using calcium perphosphate, calcium sulfate, and calcium oxide have been used to eliminate heavy metals and acids from waste water. Water soluble organic solvents are decomposed in the aeration tank; water insoluble solvents are eliminated by adsorption on a rice straw mat.

30087 **APTIC NO. 52257**

Tamura, Zensuke and Yukio Hishinuma

GAS DESULFURIZATION. *(Verfahren und Vorrichtung zur Entschwefelung von Industrieabgasen). Text in German. (Hitachi, Ltd., Tokyo (Japan)) W. Ger. Pat. 1,669,314. 5p., Sept. 21, 1972. 4 refs. (Appl. Aug. 8, 1967, 2 claims).*

Industrial waste gases are desulfurized by means of activated charcoal, in the following stages from the top to the bottom of a column: low temperature adsorption, high temperature adsorption, desorption of sulfur oxides with the help of heated inert gases, and cooling of the regenerated charcoal. A desorption temperature of 400 C is maintained, whereafter cooling of the charcoal to 100 C is achieved by spraying water directly onto the adsorbent. The cooled regenerated material is discharged at the bottom of the column and conveyed upwards to the top of the column where it enters the low temperature adsorption stage.

30088 **APTIC NO. 52335**

Umekawa, Tetsutaro

RECENT DESULFURIZATION TECHNIQUES OF HEAVY QUALITY OIL. *(Saikin no jushitsuyu datsuryu gijutsu). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 14(6):302-314, Dec. 1972. 11 refs.*

Japanese fuel standards are 0.99% or less sulfur in heavily polluted areas, 1.30% or less in slightly polluted areas, and 1.45% or less in other areas; the average is 1.25%. By 1975 these standards will be lowered to 0.7%, 0.99%, and 1.25%, respectively. By 1973 the desulfurization capacity will be 887,500 (B/D) in Japan. Various hydrodesulfurization, hydrogenation cracking, contact cracking, thermal cracking, and gasification desulfurization processes are discussed.

1971

30089 **APTIC NO. 52391**

Bapseres, P.

THE POLLUTION CONTROL IN PETROLEUM CHEMISTRY REFINING INDUSTRY. *(La lutte contre la pollution dans l industrie du raffinage et la petrochimie). Text in French. Entropie, no, 41:113-121, Sept.-Oct. 1971.*

The situation of the research carried out in the French petrochemicals industry is explained in order to control the air pollution created by this industry. This situation imposes on the petro-chemicals industry a considerable effort of control and perfecting of efficient processes for reduction and purification of air pollution. New techniques developed are presented.

30090 **APTIC NO. 52369**

Brewer, Gerald Ledon

COMBUSTION CATALYST FOR WASTE GASES. *(Vollmetallkatalysator). Text in German. (Universal Oil Products Co., Des Plaines, Ill.) W. Ger. Pat. Appl. 2,164,123. 23p., Dec. 23, 1971. (12 claims).*

The application of mats containing crimped bands of iron alloys electroplated with palladium-platinum layers to waste gas combustion was examined. The catalysts were tested in the combustion of benzene and heptane for 76.5-293 hours at 371-593 deg. The nickel-free Kanthal D catalyst with 22% chromium, 4.5% aluminum, and 0.5% cobalt achieved 66.4% benznee conversion after 105 hr at 371 degrees compared with the Nikrothal catalyst with 35% nickel and 19% chromium which achieved 51.7% conversion after 102 hr at 371 deg.

30091 **APTIC NO. 52366**

Cowen, P. S.

CUPOLA EMISSION CONTROLS. *AFS (Amer. Foundrymens Soc.) Trans.), 71(49):125-134, 1971 (?). 28 refs.*

The planning, design, and implementation of cupola emission control is discussed. Various considerations reviewed included emission limitations, the characteristics of the emissions, and the cupola factors that can effect emissions. Application of limitations to cupola operation can be based on one or more of four items: limits on particulate matter (dust), carbon monoxide, opacity, and sulfur compounds. The control of particulate matter is most important because of the magnitude of control problems and engineering approaches. Carbon monoxide can be easily controlled in normal cupola practice. Opacity is a peculiar problem limited to the United States and is not related directly to emissions of matter. Sulfur emissions are no particular problem, and an explanation as to why foundrymen need not be concerned with these emissions is included. (Author abstract modified)

30092 **APTIC NO. 52386**

Jacobs, Harry E., J. F. Jones, and R. T. Eddinger

HYDROGENATION OF COED PROCESS COAL-DERIVED OILS. *Ind. Eng. Chem. Process Design Develop., 10(4):558-562, Oct. 1971. 2 refs. (Presented at the American Chemical Society, Div. of Hydrogen Processing of Solid and Liquid Fuels, 160th Meeting, Chicago, Ill., Sept. 1970.)*

Oil produced by the COED process was hydrogenated in bench units. The COED process produces oil by low temperature pyrolysis of coal. The hydrogenation was conducted at 3000 psig over a fixed bed of nickel/molybdenum catalyst. The response to hydrogen was varied with the source of the coal. Hydrogen consumption, and oxygen, nitrogen, and sulfur removal were correlated with operating conditions. The properties of the hydrogenated products were examined and were suitable for processing in conventional petroleum refinery units. The removal of heteroatoms and the gross consumption of hydrogen occurring during the hydrogenation of COED coal oils can be correlated by simple, first-order kinetics. The oil from Pittsburgh-seam coal is more difficult to hydrogenate than the oils from Utah A-steam and Illinois No. 6-seam coals. The Utah oil requires less hydrogen than the other two to produce superior oil. The product oils are naphthenic, containing high cycloparaffin concentrations. They contain little residuum and can be processed by conventional petroleum refining methods. (Author abstract modified)

30093 **APTIC NO. 52259**

Koppang, Richard Raymond and Harland L. Burge, Jr.

FOSSIL FUEL BURNER WITH DECREASED EMISSION OF AIR-POLLUTING SUBSTANCES. *(Brenneranordnung mit vermiderter Emission von die Luft verunreinigenden Stoffen). Text in German. (TRW Inc., Redondo Beach, Calif.) W. Ger. Pat. Appl. 2,150,112. 16p., Oct. 7, 1971. (12 claims).*

A new type of burner consisting of two coaxial tubes through which the fuel gas and the air are introduced into the reaction zone is described. When the gases leave the coaxial tubes they are initially mixed by a deflector plate. Provision is also made for air introduction at several points into the reaction zone, thus forcing the combustion to completion, while at the same time the reaction time is kept as short as possible and the reaction temperature is kept low. This eliminates the formation of carbon monoxide and nitrogen oxides in the effluent gas.

30094 **APTIC NO. 52244**

Kuniyasu, Yoshihirio, Toshiyuki Sakai, and Takashi Ogami

ALUMINUM OXIDE-CONTAINING CATALYST FOR OXIDATION OF CARBON MONOXIDE. *(Katalysator mit erhoehter Waermebestaendigkeit zur Reinigung von Kohlenmonoxyd enthaltednen Abgasen). Text In German. (Mitsui Mining and Smelting Co., Ltd., Tokyo (Japan)) W. Ger. Pat. Appl. 2,156,414. 16p., Nov. 13, 1971. 6 refs. (10 claims).*

The heat properties of bismuth oxide-, manganese oxide-, and/or lead oxide containing catalysts for oxidation of carbon monoxide in automobile exhaust gases were improved by adding 5-70% aluminum oxide. Thus 50 parts of catalyst containing manganese dioxide 40, manganic oxide 30, copper 15, bismuth trioxide 10, and bismuth pentoxide 5% was mixed with 35 parts aluminum oxide and 15 parts aluminum cement (80% Al_2O_3). The mixture was then compacted for 5 sec at 400 deg and 2 metric tons/sq cm. The catalysts were treated with exhaust gas containing 5.1% carbon monoxide, 220 ppm hydrocarbons, and 50 ppm nitric oxide to give 0.4% CO and 70 ppm hydrocarbons.

30095 **APTIC NO. 52247**

Naber, Jaap Erik, Bernardus Jacobus Runderkamp, Cornelis Wilhelmus Johannes Verwey, Heinz Voetter, Nicolaas van Lookeren Campagne, and Frederik Hendrik Franses

REMOVAL OF SULFUR OXIDES FROM GASES. *(Verfahren zur Entfernung von Schwefelverbindungen in der Form von Schwefeloxyden aus Gasen oder Gasgemischen, die einen oder mehrere gasfoermige Schwefelverbindungen enthalten, sowie eine ze diesem Zweck geeignete Vorrichtung). Text in German. (Shell Internationale Research Maatschappij N. V., Den Haag (Netherlands)) W. Ger. Pat. Appl. 2,151,793. 41p., Oct. 18, 1971. (28 claims).*

Sulfur oxides were removed from gases containing some oxygen by fixed beds of copper and/or copper oxide acceptors on supports at 375-930 deg. Under these conditions, hydrogen sulfide was converted to sulfur oxides and also removed. The acceptor layers were regenerated by reduction and oxidation at the same temperature, so that three or more acceptor layers could be used in a plant for the continuous removal of sulfur oxides; the gases passing over the layers would be changed periodically.

30096 **APTIC NO. 52360**

Newbold, Robert Miller

APPARATUS FOR REMOVING THE HARMFUL CONSTITUENTS OF COMBUSTION PROCESSES. *(Vorrichtung zum Reinigen der Abgase von Verbrennungsprozess von Schadstoffen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,136,265. 13p., July 20, 1971. (12 claims).*

Contaminated gases are purified by ionization to form stable compounds and elementary gases such as oxygen and nitrogen so that the emerging purified gas contains no atmospheric pollutants. The apparatus consists of an ionization chamber with a rear wall containing an inlet for waste gas and a forward wall for exit of purified gas. The outside wall of the chamber has an inner circular wall containing the coils carrying the current to generate a continous high-intensity high-frequency electric field for ionization of the gas passing through the chamber. An initiator is situated close to the inlet. At the rear end is a cooling device with circulating coolant against which the ionized gases impinge prior to passage into the surroundings as cooled and deionized gases free from pollutants.

30097 **APTIC NO. 52237**

Paraskos, John Angelo and Allen Evarts Somers

HYDRODESULFURIZATION OF TOPPED PETROLEUM. *(Verfahren zum katalytischen hydrierenden Entschwefeln von schwefel- und metallhaltigen Rohoelen oder Ruckstandsoelen). Text in German. (Gulf Research and Development Co., Pittsburgh, Pa.) W. Ger. Pat. Appl. 2,160,889. 25p., Dec. 8, 1971. (13 claims).*

To increase the total amount of desulfurized petroleum/kg catalyst, Kuwait petroleum topped by 50% and containing nickel and vanadium impurities was hydrodesulfurized over a nickel-cobalt- molybdenum (aluminum oxide support) catalyst at such low space velocity that the catalyst was covered completely with metal impurities prior to reaching the upper temperature limit of 421 deg. Thus, topped petroleum containing 4.06% S, 170 ppm Ni, and 54.0 ppm V was hydrodesulfurized over a Ni 0.6 Co 1.1-Mo 7.9% catalyst at 0.7 kg petroleum/kg catalyst to yield 6520 kg petroleum containing 0.95% S, 4.0 ppm Ni, and 6.9 ppm V/kg catalyst as compared to 4630 kg petroleum at liquid space velocity of 2.0/hr.

30098 **APTIC NO. 52401**

Simpson, Bruce H.

AUTOMOTIVE EMISSIONS CONTROL. *J. Wash. Acad. Sci., 61(2):128-137, June 1971. 8 refs.*

Motor vehicles account for 38.9% of the total mass of man-made air pollutants in the U. S. However, when relative harmfulness of individual pollutants is considered, the motor vehicle contribution is reduced to about 12%. Current model motor vehicles emit approximately 83% less hydrocarbons and 70% less carbon monoxide than precontrolled vehicles. By 1976, vehicles are expected to reduce HC emissions by 98%, CO by 97%, and oxides of nitrogen by 90%. The California Air Resources Board has shown that motor vehicle emissions of HC and CO in the South Coast Basin have been reduced by 18% and 13%, respectively, from peak values which occurred during the mid-1960 s. The NOx emissions continued to increase until 1971, but are now declining. Total nationwide emissions from motor vehicles are also declining, in spite of an increasing car population. Automotive power plants for the balance of this decade will be highly refined derivatives of today s internal combustion engines. Exhaust gas recirculation, thermal reactors, and catalytic converter systems are being developed to meet future requirements, although both customer acceptance factors and emission control are not fully acceptable at this time. Lead-free fuel will be required to insure satisfactory component life, to minimize harmful effects of combustion chamber deposits, and to significantly reduce the emission of particulate matter. Major variations of the reciprocating internal combustion engine, gas turbines, Rankine cycle engines, and electric propulsion systems are also being actively developed to meet future needs for virtually emission-free vehicles. (Author abstract modified)

30099 **APTIC NO. 52395**

Welty, Albert B., Jr.

FLUE GAS DESULFURIZATION TECHNOLOGY. *Hydrocarbon Process., 50(10):104-108, Oct. 1971. 18 refs. (Presented at the American Institute of Chemical Engineers, Southern Calif. Section, Technical Symposium, April 1971.)*

Flue gas desulfurization is expected to be an important air conservation process for power plants and for the hydrocarbon processing and other heavy fuel-consuming industries. Selection and design of flue gas desulfurization processes are discussed in terms of economics. The fundamentals of flue gas desulfurization are described. Chemical and engineering possibilities for developing such processes are reviewed. The chemical possibilities for the process are usually based on sulfur dioxide-containing gas. Under special conditions hydrogen sulfide-containing gas from partially consumed fuel can be treated and the desulfurized gas further burned to recover the remaining heat. Different reactions involved in these two approaches are presented. A number of factors such as presence of sulfates, solubility of the sulfites and sulfates, conversion reactions and decomposition heat requirements are discussed in selection of wet scrubbing process.

30100 **APTIC NO. 51851**

Wentworth, J. T.

THE PISTON CREVICE VOLUME EFFECT ON EXHAUST HYDROCARBON EMISSIONS. *Combust. Sci. Technol., 4(2):97-100, Oct. 1971. 3 refs.*

Exhaust hydrocarbon concentrations of a spark ignition engine with a revised sealed ring-orifice (SR-O) design were determined with a non-dispersive infrared analyzer. In the revised design, the piston-bore-ring crevice was virtually eliminated. Hydrocarbon concentrations were 20-40% lower compared with the first design SR-O. Reductions compared with the production design with no emission control varied from 47% at 800 rpm and 12 in. Mercury intake depression to 74% at 2000 rpm and full throttle. However, durability of the second design would be unsatisfactory for passenger car service, particularly with respect to the life of the rubber seal used and the strength of the top band.

1970

30101 **APTIC NO. 52425**

Averbukh, T. D.

METHANE PROCESS OF PRODUCING SULFUR FROM CONCENTRATED SULFUR DIOXIDE GASES OF NON-FERROUS METALLURGY. *Soviet J. Non-ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 11(11):27-31, Nov. 1970. 37 refs.*

A methane process for producing sulfur from concentrated sulfur dioxide gases in non-ferrous metallurgy is described. The formula for the chemical reaction of sulfur dioxide with methane is given. The kinetics of the high-temperature process of methane reduction are discussed, along with the kinetics of low-temperature (catalytic) reduction of sulfur dioxide with methane. Technical economic indices for producing elemental sulfur by the methane method are presented.

30102 **APTIC NO. 52258**

Heinze, Gerhard and Reiner Sarnes

ADSORPTION PROCESS FOR DRYING AND SEPARATING GAS MIXTURES BY PRESSURE CHANGES. *(Verbessertes Verfahren zur Trocknung und Zerlegung von Gasgemischen). Text in German. (Farbenfabriken Bayer A.-G., Leverkusen (West Germany) and J. F. Mahler, Apparate- und Ofenbau K.-G., Esslingen (West Germany)) W. Ger. Pat. Appl. 2,055,425. 19p., Nov. 11, 1970. (10 claims).*

Separation of moist gas mixtures by pressure-change procedures is carried out in an adsorption system including two consecutive zones. The gas is dried in the first zone and the more readily absorbed gases are separated from the dried mixture in the second zone. The dried unadsorbed gas is collected in a storage tank, and the adsorbed gas is returned by lowering the pressure through the drying system in the first zone. The gas-adsorption cycle may be carried out at atmospheric pressure and desorption at pressures as low as 50 mm of mercury, or at 15 atm and atmospheric pressure, respectively. The cycles are operated by using a vacuum pump and a series of regulating, by-pass, and check valves. The two zones may be filled with silica gel and calcium or strontium zeolite. Uses of the system include enriching air with oxygen, preparing carbon dioxide-free gas mixtures, and eliminating nitrogen from moist gases.

30103 **APTIC NO. 52245**

Hergt, Martin

COMBINATION PROCESS FOR KEEPING AIR CLEAN, WASTE-GAS UTILIZATION AND EXHAUST SYSTEM, ESPECIALLY FOR OIL HEATING PLANTS. *(Kombinationsverfahren zur Reinhaltung der Luft, Abgasverwertung und Abgasfuehrung, insbesdonere fuel Oelheizungsanlgen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,056,825. 16p., Nov. 19, 1970. (31 claims).*

A purification process for unburned constituents from an oil heating plant uses known procedures for catalytic combustion of the constitutents, with transfer of waste gas heat to heat exhangers and combustion air and with accelerated transmission of waste gas streams and combustion air. The catalytically burned waste gases are cooled by successive passage through heat exchangers and catalytic beds to a temperature below the dew point. The precipitated condensate is collected by gravity as it flows down the walls of the exchanger counter current to the gas stream, carrying along unconsumed oil and dirt particles. The collected condensate is neutralized with alkali or reacted with scrap iron, and the evolved hydrogen is added to the recycled air for combustion.

30104 **APTIC NO. 52018**

Lautner, William Kunz

THE FILTRATION OF RAGWEED POLLEN USING GLASS FIBROUS MEDIA. *Vanderbilt Univ., Nashville, Tenn., Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., May 1970, 317p. 89 refs.*

The filtration characteristics of glass fibrous media were investigated using ragweed pollen. Efficiencies were measured as a function of fiber weight/unit area which incorporated filter thickness, average fiber size, and air velocity. The efficiency values measured ranged from 6 to 95%; the fiber density 0.02 to 0.40 lbs/sq ft, the fiber size 1.4 to 113 micron, and the air velocity 150 to 1800 ft/min. The particle bounce or rebound sometimes associated with solid particles inertial impaction type filtration was the predominant mechanism. The exponential law of penetration (1-efficiency) as a logarithmic function of fiber density was verified. Previous literature implies this relationship but does not substantiate it with much data. A modified single fiber filtration theory could be applied to this study, and the data were correlated to the general equation. The single fiber efficiency was a function of three dimensionless groups, an inertial parameter, the Reynolds number based on the fiber size, and the particle to fiber diameter ratio. The filtration mechanism was dependent on the particle to fiber size ratio with a minimum single fiber efficiency indicated at a ratio of fiber diameter ratio equal to 1.0. A miniaturized set of sampling probes were designed and utilized and these yielded satisfactory results. Grid paper membranes were used to catch the pollen particles by a combination of impaction and controlled suction. A total area particle counting method was developed using a low magnification microscope. Measuring filtration efficiency using both the probes and the counting technique was relatively fast with an overall accuracy of, plus or minus 7%. (Author abstract modified)

30105 **APTIC NO. 52359**

Melchior, Walter

COMBATING THE CONTAMINATION OF AIR BY INTERNAL COMBUSTION ENGINES. *(Verfahren und Vorrichtung zur Bekaempfung der Luftvergiftungan Verbrennungsmotoren). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,058,205. 6p., Nov. 23, 1970. 7 refs. (5 claims).*

The air supply to an automobile motor when idling or in operation is regulated by a device consisting of a housing for a rotating drum with threaded bores into which idling and running nozzles are fitted. By automatic regulation of the air supply, the formation of rich exhausts mists is avoided and the carbon monoxide content of the exhaust is reduced to a minimum.

30106 **APTIC NO. 52236**

Pedersen, Bjarne

TREATMENT OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES, ESPECIALLY OF MOTOR VEHICLES. *(Vorrichtung und Verfahren zur Behandlung der Abgase von Verbrennungskraftmaschinen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,053,496. 22p., Oct. 30, 1970. (23 claims).*

Hot exhaust gases from internal combustion engines are mixed with air passed into a reaction chamber where carbon monoxide and unreacted hydrocarbons are oxidized. The heat of the reaction is partly removed. The effluent gases are then filtered through potassium manganate and charcoal and passed into an afterburner containing a glow plub where any remaining unreacted hydrocarbons are oxidized. The amount of air required for oxidation is regulated by the exhaust gas flow, as is the cooling of the reaction chamber.

30107 **APTIC NO. 52363**

Schuhknecht, Wolfgang, Helmut Kunz, Hans-Guido Klinkner, and Guenter Culmann

SALT PASTE FOR BINDING DUST IN THE WORKING OF MINES. *(Salzpaste zur Staubbindung im Bergbau). Text in German. (Saarbergwerke A. G., Saarbruecken (West Germany)) W. Germ. Pat. Appl. 2,056,059. 11p., Nov. 14, 1970. (9 claims).*

A gel forming or coarse grained structure producing inorganic salt such as Ca3(PO4)2, Al(OH)3, or silica gel in water is precipitated and stirred with the addition of 10-80% by weight hygroscopic organic wetting agent selected from polyhydroxy alcohols, as glycol, glycerol, sorbitol, or salts of lower fatty acids. The organic constituent may contain an added preservative. This salt pasted can be used for binding dust in mine works.

30108 **APTIC NO. 52364**

Schuhknecht, Wolfgang, Helmut Kunz, Hans-Guido Klinkner, and Guenter Culmann

SALT PASTE FOR BINDING DUST IN THE WORKING OF MINES. *(Salzpaste zur Staubbindung in Bergbau). Text in German. (Saarbergwerke A. G. Saarbruechen (West Germany)) W. Ger. Pat. Appl. 2,056,061. 11p., Nov. 14, 1970. (11 claims).*

Salt paste containing magnesium chloride and/or calcium chloride and a wetting agent consisting of a cellulose derivative flocculated by electrolyte coagulation may contain one or more cellulose derivatives 2-4% by weight. The salt paste may also contain alkali or alkaline earth metal hydroxides and a corrosion protective agent such as amine, amide, or amine oxide in an amount up to 10% by weight. The cellulose derivative may be coagulated with sodium phosphate or by the corrosion protective agent.

30109 **APTIC NO. 52241**

Schuler, Dominik

INTRODUCTION OF FLUE GASES CONTAINING CARBON DIOXIDE AND AMMONIA INTO A UREA SYNTHESIS PLANT. *(Verfahren zer Einfuhrung von Kohlendioxide oder Kohlendioxid und Ammoniak enthaltenden Gases in ein Anlage fuer die Herstellung von Harnstoff). Text in German. (Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen (West Germany)) W. Ger. Pat. Appl. 2,053,358. 10p., Oct. 30, 1970. (1 claim).*

Flue gases containing carbon dioxide and ammonia were introduced into an absorber containing carbamate solution, connected with the high pressure part of a urea synthesis plant, at 125-148 deg and 26-46 atm, regulating the NH3-CO2 ratio in the solution at 0.78-1.25:1. Thus, a carbamate solution with a freezing point of 85 deg containing 9500 kg CO2, 10,250 kg NH3, 1800 kg urea, and 8100 kg/hr water was introduced into the absorber at 125 deg and 26 atm along with 3500 kg/hr flue gas containing 1900 kg CO2 and 1900 kg NH3. The freezing point of the solution increased to 98 deg, and the solution leaving the absorber had a 1.04:1 NH3-CO2 ratio.

30110 **APTIC NO. 52297**

Semavin, Yu. N. and B. V. Lebed

TECHNOLOGY OF PRODUCING ELEMENTAL SULFUR FROM METALLLURGICAL GASES BY THE SULFIDE METHOD. *Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 43(10):23-25, Oct. 1970. 3 refs.*

It is economically effective to produce elemental sulfur from the exhaust gases of metallurgical production since it improves working conditions, makes products transportable, and provides the rapidly rising demand for elemental sulfur. A method is proposed for producing elemental sulfur. Gas containing sulfur dioxide is passed over the sulfide of the metal which reduces the sulfur dioxide to elemental sulfur. The proposed method was tested on calcium sulfide. Reaction kinetics and thermodynamics of the method are described. The results suggest that the oxidation of calcium sulfide is accompanied by the production of sulfate and not oxide. On the basis of laboratory experiments, expanded research was conducted. Production and price data for the process are presented.

1968

30111 **APTIC NO. 51918**

Hesketh, Howard Edward

CLOUD-TYPE ATOMIZATION OF A LIQUID STREAM BY A GAS STREAM IN A VENTURI SCRUBBER. *Pennsylvania State Univ., University Park, Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Dec. 1968, 121p. 44 refs.*

Cloud-type atomization of a scrubbing liquid (water) by air in a venturi scrubber was studied to determine the place where the water was atomized, the particle size of the atomized liquid, and the acceleration of particles. This information is useful in collection efficiency studies for inertial impaction type atomizers. A photographic system was set up to observe the atomization process in the throat and diffuser of a venturi scrubber, and to measure velocity. Two distinct type of atomization were observed -- cloud-type atomization, occurring when large water nozzles were used, and drop-type atomization, occurring when spray nozzles were used. Particle size distributions and atomization efficiencies were determined for both types. Venturi scrubber operating conditions, experimental results, and mathematical correlations are discussed also.

30112 **APTIC NO. 52009**

Ludington, David Corbin

OXIDATION-REDUCTION POTENTIAL, CONTROL BY AERATION AND INFLUENCE ON ODOR PRODUCTION AND DEGRADATION OF CHICKEN MANURE. *Purdue Univ., Lafayette, Ind., Dept. of Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Jan. 1968, 158p. 17 refs.*

A solution is sought for the problem of reducing or eliminating the odors produced by chicken manure while in storage. Research was conducted to study odor production (hydrogen sulfide) and degradation in the region between excessive aeration and no aeration of chicken manure. Dissolved oxygen and oxidation reduction potentials were both investigated as possible means of quantitatively defining the conditions between the two extremes of aeration. The dissolved oxygen probe was not applicable because the measurements were erratic and unpredictable when solids were present in the liquid being tested. The ORP (oxidation-reduction potential) measurement responded to the presence or absence of aeration. The ORP also permitted a continuous monitoring of conditions from strictly aerobic to anaerobic and could be incorporated into an automatic control system to regulate aeration. Results show that chicken manure stored without aeration produced H2S while that stored with aeration produced no H2S. Chicken manure stored with aeration at zero ORP also produced no odors but had a higher reduction of volatile solids. The ORP was automatically controlled by an electronic system by regulating the rate of aeration.

MEASUREMENT METHODS

1973

30113 APTIC NO. 52406

Acton, L. L., M. Griggs, G. D. Hall, C. B. Ludwig, W. Malkmus, W. D. Hesketh, and H. Reichle

REMOTE MEASUREMENT OF CARBON MONOXIDE BY A GAS FILTER CORRELATION INSTRUMENT. *AIAA (Am. Inst. Aeron. Astronaut.) J., 11(7):899-900, July 1973. 2 refs. (Presented at the American Institute of Aeronautics and Astronautics, Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1107.)*

A gas filter correlation instrument for remote determination of carbon monoxide in the atmosphere was developed and tested. The instrument, which operates in the 4.6-mincron band of CO based on the principle of nondispersive optical correlation, provides an output signal related to the amount of CO in the atmosphere. This output, together with measurements of the surface temperature and the atmospheric temperature profile, determines the mean CO concentration between the aircraft and the ground. (Author abstract modified)

30114 APTIC NO. 52202

Bach, Rolf-Werner, Erwin Doetsch, Hans Adolf Friedrichs, and Lothar Marx

ANALYSIS OF UNBURNED HYDROCARBONS IN WASTE GASES FROM BURNING FUEL OIL. *(Nachweis unverbrannter Kohlenwasserstoffe in Heinzoelabgasen). Text in German. Staub, Reinhaltung Luft, 33(6):254-258, June 1973. 14 refs.*

Exhaust gases from an atomizing burner operated with EL fuel oil in the excess air range were analyzed by gas chromatography for concentrations down to 5 ppm. With a combined retention index boiling point method, 30 hydrocarbons were identified belonging to the alkane, alkene, naphthene, and simple aromatic groups. The unburned components generally occurred during discontinuous operation of the maladjusted burner. The emitted unburned substances decreased approximately linearly with increasing carbon dioxide content. An odorimetry test confirmed the quantitative results.

30115 APTIC NO. 52095

Baird, Jon G. and John C. Robbins

MERCURY VAPOUR ANALYSIS IN EXPLORATION. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 17p., 1973. 7 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-I-89.)*

Mercury vapor analysis in geothermal exploration is investigated. The chemical and physical details of the migration processes of mercury are not yet fully understood. At the time of deposition of a hydrothermal ore body or during metamorphism of either hydrothermal or syngenetic ore deposits, mercury may migrate upwards into the adjacent hot rocks. There is also evidence that mercury can be liberated during tectomic activity. During weathering and oxidation, mercury ions, metallic mercury, or mercury vapor may be liberated from the sulfides. Atomic absorption techniques are used for measurement techniques for mercury. Atomic absorption instruments designed to measure the concentration of mercury in a sample of air by recording the degree of absorption of ultraviolet radiation at a specific frequency have been known for some time. New developments in this method are discussed. Now that sensitive instruments, highly selective for mercury are available in portable and low-cost form, it would appear that an increasing number of field surveys are warranted.

30116 APTIC NO. 52275

Barbieri, A.

DETERMINATION OF THE AIR POLLUTION LEVELS IN INDUSTRIAL AND URBAN AREAS. *(Determinazione dello stato di inquinamento atmosferico in zone industriali ed urbane). Text in Italian. Riv. Combust. (Milan), 27(1):15-28, Jan. 1973. (Presented at the Congresso Nagionale di Chemica, 11th , Perugia, Italy, Oct. 19-21, 1972.)*

Adequate means and technologies exist today to assess accurately environmental pollution from both stationary and mobile sources by mathematical methods, modeling, and computers. To conduct an experimental survey of air pollutants in a given area, a suitable operational schedule of objectives must be worked out and means required to implement it must be chosen. The elaboration of operational schedules for air pollution surveys in urban and industrial areas is outlined, and a cost appraisal of such surveys is considered. Pollution can be monitored by fixed or by mobile stations. The monitoring area, the siting of the station, the measuring apparatus, the analytical methods, and operational programs have to be decided on. A site for a measuring station must be free of obstacles, downwind from a stationary pollution source, in a critical location with easy access for vehicles, and with available electric power. The scope of the study must be defined, the pollutants to be measured identified and the number of measurements required and the frequency of measuring determined. The operational program entails the determination of the duration of the survey, of the measuring times, of the number of stations, of data analysis, and of tabulation of results. An area to be measured by a mobile monitoring van is divided into equal 1 sq km subdivisions covering a circle with a 3 km radius around the emission source. Monitoring of pollution from mobile sources is performed by stationary or mobile stations in residential, historical, commercial, industrial, rural, and suburban zones.

30117 APTIC NO. 52101

Borkowska, Maria, Artur Strusinski, and Halina Wyszynska

COLORIMETRIC METHOD OF DETERMINATION OF FLUORINE IN ATMOSPHERIC AIR. *(Kolorymetryczna metoda oznaczania fluoru w powietrzu atmosferycznym). Text in Polish. Roczniki Panstwowego Zakladu Higi., 34(1):109-114, 1973. 35 refs.*

The methods of fluorine determination in atmospheric air are described. A number of modifications of the colorimetric methods of fluorine determination of Belcher, Leonard, and West are mentioned. The technique of fluorine determination in atmospheric air using alizarin and lanthanum salts in a modification is described in detail. The optical density is read on the spectrophotometer with 620 nm wavelength. The detection threshold of this method is 0.5 micrograms in a 5 ml sample; this enables the detection of 8 micrograms/cu m using 60 l test air. The sensibility of the method can be increased by measuring the absorbance on the spectrophotometer using 281 nm wavelength.

30118 APTIC NO. 51991

Bruner, Fabrizio, Paolo Ciccioli, and Roberto Rastelli

THE DETERMINATION OF CARBON MONOXIDE IN AIR IN THE PARTS PER BILLION RANGE BY MEANS OF A HELIUM DETECTOR. *J. Chromatog., 77(1):125-129, March 1973. 7 refs.*

The separation and quantitation of traces of carbon monoxide from air were performed using molecular sieve columns and helium flame ionization detectors. Calibration curves obtained by the exponential dilution method were linear down to about 50 ppb. A comparison of the curves obtained using helium or air as diluting gases was made. (Author summary)

30119 **APTIC NO. 52493**

Bultez, A.

DETERMINATION OF NITROGEN OXIDES IN FLUE GASES. *(Dosage des oxydes d azote dans les gaz de combustion). Text in French. Analusis, 2(3):190-198, March 1973. 4 refs.*

An analyzer consisting of a peristaltic pump, a colorimeter equipped with a circulation cell, and a recorder was adapted to continuous monitoring of nitric oxide and nitrogen dioxide in combustion gases of steam generators. The method makes use of the Griess Saltzmann color reaction and collects the condensation water from the combustion gas in which part of the NO2 is solubilized. Total oxidation of NO to NO2 is accomplished with oxygen. Calibration of the apparatus with a calibration gas on one hand and with sodium nitrite solutions yields a curve indicating the variation of the Saltzmann coefficient as a function of the nitrogen oxides concentration in the sample. In an aqueous medium, NO2 with water yields nitrous and nitric acid. In the presence of sulfanilic acid and of N-(naphtyl-l) ethylene diamine dichlorohydrate in an acetic acid medium (pH 2) the nitrite ions yield by diazotation and by copulation a red azo compound whose maximal intensity materializes in 10 minutes and is determined at 550 nm.

30120 **APTIC NO. 52439**

Butler, John D. and David M. Thorne

ESTIMATION OF NITRIC OXIDE EMISSIONS FROM AN INTERNAL COMBUSTION ENGINE. *J. Appl. Chem. Biotechnol., 23(3):195-203, March 1973. 9 refs.*

Two methods were tested for the determination of nitric oxide in the exhaust gas from an internal combustion engine. Analytical determinations using the Saltzmann colorimetric method and the gas phase chemiluminescence method were in good agreement. Calibration techniques, sampling methods, and storing problems are reviewed. (Author abstract modified)

30121 **APTIC NO. 52478**

Byer, Robert L. and Max Garbuny

POLLUTANT DETECTION BY ABSORPTION USING MIE SCATTERING AND TOPOGRAPHIC TARGETS AS RETROREFLECTORS. *Appl. Opt., 12(7):1496- 1505, July 1973. 13 refs.*

Remote pollution detection methods using lasers based on backscattered absorption are investigated. Topographical reflectors and the strong Mie backscattered signal as distributed reflector methods are described and analyzed in detail. Remote pollutant measurement by absorption using topographical reflectors or atmospheric Mie scattering as a distributed reflector offers increased range and sensitivity compared to that achieved by Raman or resonance backscattering methods. The use of topographical reflectors offers the advantage of a single-ended absorption measurement for ranges up to 10 kn and sensitivities to less than 0.01 ppm for a 10 mega-joule, 100 nenosecond transmitted pulse. The distributed Mie reflector permits absorption measurements with depth resolution to ranges between 1 km and 3 km for a 100 mega-joule transmitted pulse energy. This sensitivity is 10,000 to 100,000 times better than that achieved by the Raman method. (Author abstract modified)

30122 **APTIC NO. 51829**

Caroff, M., K. R. Choudhary, and J. W. Gentry

EFFECT OF PORE AND PARTICLE SIZE DISTRIBUTION ON EFFICIENCIES OF MEMBRANE FILTERS. *Aerosol Sci., 4(2):93-102, March 1973. 14 refs.*

A method was developed to account for the effect of particle and pore size variation on the collection efficiency of membrane filters. The errors in neglecting the particle size distribution and the pore size distribution are as large as or larger than those associated with neglecting direct interception. It is simple to correct the efficiency for both particle and pore size distribution. To account for the particle size distribution, it is only necessary to integrate over the particle size distribution, whereas the variation in the pore size can be accounted for by integrating a weighted average of the pore size distribution. The basic assumption is that the pressure drop across all pores in the filter is uniform.

30123 **APTIC NO. 51808**

Chackerian, C., Jr. and M. F. Weisbach

AMPLIFIED LASER ABSORPTION: DETECTION OF NITRIC OXIDE. *J. Opt. Soc. Am., 63(3):342-345, March 1973. 14 refs.*

Experimental results are reported for the power loss of a carbon monoxide gas laser due to the absorption of small amounts of nitric oxide placed in an intra-laser-cavity absorption cell. For the particular experimental conditions employed, the absorption coefficient of nitric oxide at 1900.04 cm is enhanced more than two orders of magnitude when it is in the intracavity cell. The experimental results are in excellent agreement with theory for the 1935/cm line pair, while the theoretical predictions are about 50% higher than most of the experimental data for the 1900/cm pair. Intracavity absorption is a competitive technique for detecting small amounts of nitric oxide. The sensitivity of the method can be increased by running the laser at the lowest possible gain. (Author abstract modified)

30124 **APTIC NO. 52030**

Clarenburg, Louis A.

AIR POLLUTION MEASUREMENT AS A TOOL FOR PRACTICAL POLICY AND CONTROL STRATEGY. *Z. Anal. Chem., 263(4):298-303, March 6, 1973. 11 refs. (Presented at Euronalysis I Conference, Heidelberg, West Germany.)*

Real-time air pollution data are needed to establish criteria for air pollution standards, to safeguard human health, and to predict long-term pollution trends. The requirements to be met by monitors depend on the scale and type of the problem, especially with respect to the degree of automation. Furthermore, monitors should be able to distinguish a signal from the variable background. The sensitivity should be adequate, the specificity high. Pollutants on a global scale include carbon dioxide from fossil fuel combustion and water vapor and particles from supersonic transport, each of which might eventually affect our climate. A monitoring standards center with a real-time data analysis capability is required for these pollutants plus nitrogen and sulfur oxides, hydrocarbons, ozone, lead, and DDT. Regional scale monitoring will add to knowledge of photochemical conversion processes and trends in pollution levels. Local-scale monitoring is necessary to determine the health effects of acute or chronic exposure to pollutants such as sulfur dioxide, nitrogen oxides, sulfuric acid, nitric acid, oxidants, carbon monoxide, and metals. Fully automated real-time measurements also provide data on the relative contribution of different categories of polluters to local pollutant concentrations. Automated monitoring systems for control of odor problems and SO2 pollution in two Dutch cities are described.

30125 **APTIC NO. 51774**

Colovos, G., G. S. Wilson, and J. Moyers

THE DETERMINATION OF TRACE AMOUNTS OF ZINC, CADMIUM, LEAD AND COPPER IN AIRBORNE PARTICULATE MATTER BY ANODIC STRIPPING VOLTAMMETRY. *Anal. Chim. Acta, 64(3):457-464, 1973. 12 refs.*

The application of anodic stripping voltammetry, with a hanging mercury drop electrode, to the determination of zinc, cadmium, lead, and copper in airborne particulate matter collected by filtration is discussed. This procedure allows for the destruction of the filter material followed by the complete dissolution, including silicates, of the collected particulate matter. A lowdtemperature ashing process is described, and the recovery of cadmium in this procedure is studied. Analytical data obtained by anodic stripping and atomic absorption for zinc, cadmium, lead, and copper are compared. (Author summary modified)

30126 **APTIC NO. 51747**

Cooper, Douglas W., R. Lee Byers, and John W. Davis

MEASUREMENTS OF LASER LIGHT BACKSCATTERING VS. HUMIDITY FOR SALT AEROSOLS. *Environ. Sci. Technol., 7(2):142-147, Feb. 1973. 25 refs.*

Hygroscopic aerosol particles generated from aqueous solutions were illuminated by He-Ne laser light to study the backscattering of the light by the particles as a function of relative humidity. Sodium chloride, potassium chloride, and sodium bromide particles with a mean mass diameter of 0.2-0.4 micron scattered more than twice as much light when humidified as they did when dry. The change from solid to liquid phase occurred at lower humidities than those appropriate for the bulk salts. The changes from liquid to solid phase occurred at lower humidities than did the solid to liquid phase changes. The effects of humidity on backscattering may affect the measurement of pollutants by lidar. (Author abstract modified)

30127 **APTIC NO. 51762**

Cross, Frank L., Jr. and Howard F. Schiff

MONITORING AIR POLLUTION. *Plant Eng., 27(6):94-96, March 22, 1973.*

The major goals for air pollution monitoring and various analytical and measuring techniques are reviewed. Most of the current monitoring effort is for particulates, sulfur dioxide, nitrogen oxides, hydrocarbons, carbon monoxide, and photochemical oxidants. The recommended sampling and analytical procedures include colorimetry, coulometry, conductometry, and chemiluminescence analysis for SO2; colorimetry and electrochemical methods for NOx; continuous sampling, non dispersive infrared analysis, and flame ionization detection for CO; chemiluminescence techniques and colorimetry for ozone; high-volume sampling for particulates; and gas chromatography, colorimetry, and flameless atomic absorption for hydrocarbons, fluoride, and mercury, respectively. Chlorine, metal, hydrogen chloride, and hydrogen sulfide methods are mentioned. Costs are cited.

30128 **APTIC NO. 52210**

Cross, Frank L., Jr. and Howard F. Schiff

CONTINUOUS SOURCE MONITORING. *Chem. Eng. Deskbook, 80(14):125-127, June 18, 1973. 3 refs.*

The latest techniques and equipment for the continuous monitoring of air pollutants are described. Schematics of some of the monitoring techniques such as chemiluminescence, flame photometry gas chromatography (flame ionization), and nondispersive infrared spectro are presented. A promising commercial unit for particulate sampling used a filtration, beta-radiation attenuation technique that includes dilution, filtration, detection of attenuated beta radiation and recorders. Other available methods using optical density or light scattering are excellent for measuring visible emissions, but are not good for determining weight rate of emissions. Preferred techniques for continuous monitoring of primary gaseous pollutants are listed. Many states now require visible-emission monitors on old and new point-source installations. All regulations now include Ringelmann or equal-opacity testing for visible emissions. Most of the standard methods for determining particle size are based on static samples. Laser holography has recently been developed for particle sizes from 0.1 to 1000 micron.

30129 **APTIC NO. 51982**

Dams, R. and R. Heindryckx

A HIGH-VOLUME AIR SAMPLING SYSTEM FOR USE WITH CELLULOSE FILTERS. *Atmos. Environ., 7(3):319-322, March 1973. 9 refs.*

The use of cellulose filters in high-volume air sampling requires a more powerful cooling system for the vacuum pump than does the use of conventional glass fiber filters. During sampling, the pressure drop across cellulose filters increases rapidly, and the widely used turbine pumps may overheat and burn out. Independently cooled rotary-vane pumps can be run for much longer time at high pressure drops. A complete sampling system including pump, shelter, filter holder, and accessories is described. Its price, including labor, is less than 600 dollars. Identical systems have been in use continuously for 1 year in both urban and remote areas and have functioned reliably. (Author abstract modified)

30130 **APTIC NO. 52518**

De Mik, G.

SENSITIVE MICROBIOLOGICAL DETECTOR FOR AIR POLLUTION DETECTION. *(Een gevoelige microbiologische detector voor luchtverontreiniging). Text in Dutch. Chem. Tech. (Amsterdam), 28(10):209-212, May 1973. 5 refs.*

The microthread technique developed for the detection of air pollutants and for the study of the microbiological action of specific air pollutants is described. The aerosol containing Escherichia coli or other microorganisms is held in suspension by means of cobwebs in closed chambers. The germicidal effect of specific pollutants such as exhaust gases and photochemical smog is best studied by exposure at night with no ozone formation due to sunlight. The survival rate of Escherichia coli, very high in clean laboratory air and in a humidity range of 50-100%, falls to very low values or zero after relatively short time of exposure to open air. Air pollution studies performed in the Netherlands by means of the microthread technique revealed the ubiquitous presence of the open air factor in terms of decreased survival rate of the test microorganisms.

30131 **APTIC NO. 52435**

Dee, L. A., H. H. Martens, C. I. Merrill, J. T. Nakamura, and F. C. Jaye

NEW MANUAL METHOD FOR NITROGEN OXIDES EMISSION MEASUREMENT. *Anal. Chem., 45(8):1477-1481, July 1973. 19 refs.*

A new time-integrated sampling method and a rapid analysis technique were developed for oxides of nitrogen emission measurement. The sample gas is drawn through a heated bed of uniquely active, crystalline lead dioxide, and NOx is quantitatively absorbed. Lead nitrate is extracted with water and subsequently determined with nitrate liquid ion exchange electrode. A simple selective precipitation eliminates interferences derived from PbO2 absorption of other combustion products such as hydrochloric acid, hydrofluoric acid, silicon tetrafluoride, sulfur dioxide, and carbon monoxide.

30132 **APTIC NO. 52500**

Doering, C. E., R. Geyer, and P. Roeske

ANALYSIS OF NITROGEN OXIDES BY GAS CHROMATOGRAPHY. II. DETERMINATION OF NO2 BY MEANS OF REACTION GAS CHROMATOGRAPHY. *(Gaschromatographische Analyse von Stickoxiden. II. Analyse von NO2 mittels Reaktions-Gaschromatographie). Text in German. Acta Chim. Acad. Sci. Hung., 75(2):89-98, 1973. 24 refs.*

The reaction of nitrogen dioxide with various organic phosphorus compounds, primarily with phosphines and phosphites, was examined for its suitability for gas chromatographic analysis of NO2. The reaction with triphenylphosphite proceeded stoichiometrically with the formation of nitric oxide. Trisubstituted phosphines R3P and phosphites (RO)3 P, where R is an alkyl or an aryl group, possess distinct nucleophile reactivity due to their free pair of electrons on the P atom. They react with numerous oxygen containing compounds like peroxides, ozone, amino oxides, epoxides, and nitrogen oxides-mostly yielding phosphine oxides or phosphates. By appropirate choice of substituents, the resulting liquids are of low volatility. Phosphates or phosphine oxides are even less volatile and remain in the reaction column, only gaseous reaction products reach the detector. Thus, the condition for the use of organic phosphorus compounds in gas chromatography is met. Since NO2 yields with phosphites NO, NO2, and nitrogen in various proportions, it is important for NO to react with organic phosphorus compounds in a manner which yields a uniformly stable reaction product. Triphenylphosphite under certain working conditions meets this requirement. The volatility of triphenylphosphite permits working temperatures up to 70 C.

30133 **APTIC NO. 52218**

England, Christopher, John Houseman, and D. P. Teixeira

SAMPLING NITRIC OXIDE FROM COMBUSTION GASES. *Combustion Flame, 20(3):439-442, June 1973. 8 refs.*

A study of reducing emissions of nitric oxide from gas-fired furnaces is reported. Considerable reduction of NO was experienced in some sampling probes when they were used to sample hot combustion gases. The probe was connected to a non-dispersive infrared analyzer. These severe sampling errors under some operating conditions are corrected by redesign of the probes. A 250,000 Btu/hr furnace, fired with technical grade methane was used in this study. In the furnace both fuel and air flows could be varied continuously to vary the equivalence ratio of the combustible mixture. Several different probes were tested over a wide range of air-fuel mixtures. The NO content of the flue gas from the test furnace was measured as a function of air-fuel ratio. The results showed considerably less NO in near stoichiometric and fuel-rich flames than was expected from furnaces of the present scale. It was suspected that catalytic reduction of the NO in the probe may have been taking place in the reducing atmosphere of the flue gases.

30134 **APTIC NO. 52412**

Florkowski, Tadeusz

METHODS OF THE FLUORESCENT ANALYSIS WITH APPLICATION OF ISOTOPE SOURCES FOR DETERMINATION OF THE COMPOSITION OF WATER AND AIR POLLUTION. *(Metody analizy fluorescencyjnej z zastosowaniem zrodel izotopowych do oznaczania skladu zanieczyszczen wody i powietrza). Text in Polish. Zesz. Nauk. Akad. Gorn.-Hutn. Stanislawa Staszica, 47(400):175-181, 1973. 7 refs.*

The analytical procedure involved in the fluorescent method for the analysis of air and water pollutants is reviewed. The method was tested on sulfur dioxide and aerosols determined in the ambient air and trace metal determination in water samples. The applicability of the technique is examined.

30135 **APTIC NO. 52050**

Fri, Robert W.

NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS. REFERENCE METHOD FOR DETERMINATION OF NITROGEN DIOXIDE. *Federal Register, 38(110):15174-15190, June 8, 1973. 21 refs.*

The Environmental Protection Agency s designated reference method for nitrogen dioxide determination overestimates low NO2 levels, underestimates high levels, and is subject to interference by nitric oxide. Three proposed alternative methods are described. A 24-hour sampling method is based on collecting NO2 by bubbling air through a sodium hydroxide-sodium arsenite solution to form a stable solution of sodium nitrite. The nitrite ion produced is reacted with phosphoric acid, sulfanilamide, and Saltzman solution to form an azo dye and then be determined colorimetrically. For continuous NO2 measurement nitrite ion is reacted with diazotizing-coupling reagents to form a deeply colored azo dye which is measured colorimetrically. Nitrogen dioxide in ambient air is converted to nitrite ion on contact with an absorbing solution (e.g., Griess-Saltzman or Lyshkow) containing the diazoting-coupling reagents. The absorbance of the azo dye is directly proportional to the concentration of NO2 absorbed. This method is applicable to NO2 concentrations from 18.8-1880 micrograms/cu m. A chemiluminescent method for continuous analysis of NO2 is based on the reaction of NO with ozone at reduced or near atmospheric pressure. Nitrogen dioxide is measured as NO after conversion of NO2 to NO. Air samples are drawn directly into the chemiluminescent analyzer to establish a NO response; a switching valve then directs the sample air through a converter where NO2 is converted to NO. Light energy resulting from the chemiluminescent reactions of NO and O3 are measured by a photomultiplier, and the amount of NO2 is determined by substracting the NO signal from the nitrogen oxides signal. The method is applicable to NO2 concentrations from 9.4-18,8000 micrograms/cu m. Calibration and calculation procedures for each method are given.

30136 **APTIC NO. 52188**

Gerhold, M.

INTEGRATED ANALYTIC SYSTEMS FOR CONTINUOUS AIR QUALITY MONITORING (PART 2). *(Integrierte Analysensysteme zur laufenden Ueberpruefung der Luftqualitaet (II. Teil)). Text in German. Mitt. Chem. Forschungsinst. Wirt. Oesterr., Oesterr. Kunstoffinst., 27(1):1-8, Feb. 1973.*

Integrated air quality monitoring systems with evaluations by means of computer programs and visualizations on a plotter are described. Meteorological parameters are monitored by a resistance thermometer between -30 and +50 C, hygrometer between 0 and 100%, Barton cell between 600 and 800 torr pressure, and turbine anemometer between 0 and 10 m/sec and between 0 and 30 m/sec. Standard systems for continuous air quality monitoring include an automatic sampling system, measuring instruments for sulfur dioxide concentrations of 0-0.5 and 0-1 mg/cu m, hydrogen sulfide concentrations of 0.-0.5 mg/cu m, nitrogen dioxide concentrations of 0.3 mg/cu m, total nitrogen oxide concentrations of 0-1.5 mg/cu m, carbon monoxide concentrations of 0-10 mg/cu m, carbon dioxide concentrations of 400-1000 mg/cu m, hydrocarbon concentrations of 0-240 cu m, and dust concentrations of 0-10 mg/cu m. The SO2 measurement is possible by gas chromatography, coulometry, and the conductivity method. Chromatography and flame photometry are applicable to H2S determination. Coulometric, chemiluminescent, and ultraviolet spectroscopic methods are suitable for the determination of NO2. Gas chromatography with a flame ionization detector and infrared analysis are used for CO and hydrocarbon monitoring. Dust monitors apply beta absorption measurement. Oxygen analyzer, total hydrocarbon analyzer, hydrocarbon analyzer, CO analyzer, CO2, total nitrogen oxide, and nitrogen dioxide analyzer are incorporated in standard monitoring systems for engine exhaust gases. Most of the units of the automatic monitoring systems are designed for mechanical assembly technique.

30137 **APTIC NO. 52475**

Granatstein, V. L., M. Rhinewine, and A. H. Fitch

REMOTE SENSING OF GAS CONCENTRATIONS IN SMOKESTACK EMISSIONS. *Appl. Opt., 12(7):1511-1515, July 1973. 12 refs.*

A measurement technique is discussed that allows for remote sensing of polluting gases that are emitted together with the water droplets in a steam plume. Infrared laser radiation is backscattered from the droplets. As wavelength of the radiation is varied, resonant absorption in the gases diminishes the backscatter signal. This may be quantitatively related to the concentration of specific gases. The backscatter arrangement makes possible the construction of a compact, single-ended, remote sensing instrument. Feasibility of the concept has been demonstrated in a laboratory experiment where a laser beam at 3.391 micron and 4.217 micron was scattered from a steam plume containing controlled amounts of methane and carbon dioxide. (Author abstract)

30138 **APTIC NO. 51758**

Greer, David G. and Thomas J. Bydalek

RESPONSE CHARACTERIZATION OF THE MELPAR FLAME PHOTOMETRIC DETECTOR FOR HYDROGEN SULFIDE AND SULFUR DIOXIDE. *Environ. Sci. Technol., 7(2):153-155, Feb. 1973. 9 refs.*

The mass-response characteristics of a flame photometric detector for hydrogen sulfide and sulfur dioxide were studied to establish a procedure for accurate calibration of the detector. The response was nonlinear due to the loss of emitted energy to self absorption. A general equation was used to describe the response; the fraction of emitted energy lost to self-absorption was a function of the sulfur mass in the sample. (Author abstract modified)

30139 **APTIC NO. 51739**

Hart, Edwin J., Klaus H. Schmidt, and Keelathur N. Vasudevan

CONDENSATION NUCLEUS DISCRIMINATOR MAKING OPTICAL MEASUREMENTS ON FOG: A TOOL FOR ENVIRONMENTAL RESEARCH. *Science, 180(4090):1064- 1067, June 8, 1973. 16 refs.*

An instrument providing a new, rapid, and accurate method of determining the number and critical radii of condensation nuclei with radii under 200 angstroms is described. Based on the principle of the cloud chamber, the instrument measures transient changes in the attenuation and scattering of a monochromatic light beam by the growing fog droplets. From data obtained, the absolute number concentration and radii of condensation nucleii were calculated. Preliminary studies of aerosol formation in beta-irradiated mixtures of air and sulfur dioxide showed that carbon monoxide and methane inhibit the formation of nucleii; relative rate constants can be deduced. Some applications of this instrument for environmental and basic research are considered. (Author abstract)

30140 **APTIC NO. 52204**

Hedgecock, G. A., D. Turner, J. T. Sandersons, S. J. Silk, S. A. Roach, W. I. Acton, G. M. Davies, E. C. Hunt, A. F. Smith, R. Wood, F. A. P. Maggs, and R. J. Sherwood

CHEMICAL INDICATOR TUBES FOR MEASUREMENTS OF THE CONCENTRATION OF TOXIC SUBSTANCES IN AIR. *Ann. Occupational Hyg., 16(1):51-62, April 1973.*

The principles of operation and use of chemical indicator tubes are described and a specification is proposed which should lead to improvements in their accuracy and reliability. An analysis of the replies to a questionnaire on the use of detector tubes, circulated to interested organizations, is included. A table has been compiled based on the results of testing commercially available tubes under standardized conditions over a number of years and an attempt made to classify the tubes according to their reliability. (Author abstract)

30141 **APTIC NO. 52492**

Heros, Marguerite and Lucien Mallet

DETERMINATION OF PYRENE BY U. V. ABSORPTION SPECTROPHOTOMETRY IN VAPORS EMITTED DIRECTLY BY ATMOSPHERIC DUST AND DIVERSE PRODUCTS. EXTENSION TO THE DETERMINATION OF OTHER POLYCONDENSED HYDROCARBONS. *(Dosage du pyrene spectrophotometrie d absorption U. V. dans les vapeurs emises directement par les poussieres atmospheriques et divers produits). Text in French. Analusis, 2(3):176-178, March 1973. 6 refs.*

Ultraviolet absorption spectrophotometry of pyrene vapors directly emitted by dust or by unsaponifiable extracts from other products is described. The method is fast because extraction is unnecessary and more exact because extraction of dust is never compiete. Heating of the absorption tube and of the two small tubes, one containing the dust, the other designed to effect the vacuum, is accomplished by means of thermocoax resistance with wires wound directly around the quartz tubes by means of aluminum foil. The temperature of the tubes can be made to vary continuously by a potentiometer. Test sample size is 500 mg to 1 g, the tube with the dust is heated to 180 C, the remainder of the apparatus to 174 C. Under these conditions no other volatile product present in the dust was generally found to interfere with the chosen absorption bands of 320 and 337 nm. A reference curve is obtained with the same dust deprived of pyrene and one to which then increasing amounts of pyrene have been added. Anthracene, pyrene, chrysene, benzo-3,4-pyrene, and coronene can be told apart by their characteristic absorption bands by variation of the pressure and temperature of the tubes.

30142 **APTIC NO. 51725**

Hrubesh, Lawrence W.

MICROWAVE ROTATIONAL SPECTROSCOPY: A TECHNIQUE FOR SPECIFIC POLLUTANT MONITORING. *Radio Sci., 8(3):167-175, March 1973. 6 refs.*

The application of microwave rotational spectroscopy to gaseous pollutant monitoring is examined. The instrumentation, design, atmospheric sampling techniques, and experimental results are reviewed. A diode-cavity spectrometer was used to detect small concentrations of nitrogen dioxide and sulfur dioxide with very high specificity. With appropriate sample handling techniques, an optimized system could be applied to monitoring specific trace pollutants.

30143 **APTIC NO. 51842**

Imai, Sakingo, Kiyoshi Ito, Akira Hamaguchi, Yuzuru Kusaka, and Munehiro Warashina

EMISSION SPECTROGRAPHIC DETERMINATION OF TRACE ELEMENTS IN AIRBORNE PARTICULATES USING MEMBRANE FILTER. *(Enburan firuta o mochiiru taikichu fuyu ryushijo busshitsu no hakko bunko bunseki). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(5):551- 558, May 1973.*

Airborne particulates smaller than 10 micron were collected on a millipore filter, using a low-volume air sampler, for 10 days at 10 m above ground level. One Half of the filter was then put in a quartz boat, moistened with ethyl alcohol, and burned. The carbonized ash was ignited for about 2 hr with a plasma asher; the decolorized ash obtained was homogenized with a mixed powder of indium oxide and palladium oxide. Using an equal amount of lithium carbonate and graphite as buffer, the sample was then subjected to an AC arc excitation. The buffer agent was selected on the basis of line intensity-exposure time experiments. The millipore filter was selected on the basis of an atomic absorption analysis for seven elements in airborne particulates. A standard sample series containing, respectively, 2, 4, 6, 10, 20, and 40 micrograms of the elements to be analyzed was prepared by adding definite amounts of the standard stock solutions on millipore filters and drying under an infrared lamp, spectographic determinations were then made in the manner described above. The method was used to determine 13 trace elements in particulate samples from three areas of Kobe. Cobalt, nickel, tungsten, and some other elements could not be detected because of the low volume of the sample. Arsenic, selenium, and mercury could not be analyzed

because of their high volatilities. Aluminum, titanium, vanadium, chromium, manganese, ion, copper, zinc molybdenum, silver, cadmium, antimony, and lead were measured.

30144 **APTIC NO. 51886**

Kanno, Saburo

HEAVY METALS (ATOMIC ABSORPTION SPECTROPHOTOMETRY). *(Jukinzoku (Genshi Kyuko kodoho)). Text in Japanese. Nippon Rinsho (Japan. Clin.), 31(6):1955-1965. June 1973.*

An improved method for measuring heavy metals using atomic absorption spectrophotometry is described. The improved methods are compared with the present standard methods. Difficulty of operation, the influence of interfering ions, and sensitivity are mentioned. The analyses of mercury, copper, cadmium, lead, manganese, zinc, iron, chromium, and other metals are described.

30145 **APTIC NO. 52351**

Kinoshita, Chikara, Kazunobu Ono, Masaharu Seki, Hisaichi Tomihari, and Kenji Iwai

THE ANALYTICAL METHOD OF THE BAD ODOR CONTROL ACT AND ITS PRACTICE. *(Akushu boshiho no bunsekiho to sono jissai). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6):588-596, June 1973. 9 refs.*

Analytical methods specified in the Bad Odor Control Act of 1972 are described for ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethyl amine. Ammonia is collected with a sulfuric acid-treated filter and determined by spectrophotometry. Methyl mercaptan, H2S, and methyl sulfide are collected in a U-shaped tube cooled with liquid oxygen and determined by gas chromatography. Trimethyl amine is collected with a sulfuric acid-treated filter as a salt of trimethyl amine The salt is then decomposed by a strong alkali to reform the trimethyl amine which is collected in a U-shaped tube cooled with liquid oxygen. Then it is determined by gas chromatography with a hydrogen flame ionization detector using a standard solution of trimethyl amine.

30146 **APTIC NO. 52062**

[illegible]relli, L., G. Eyer, K. Amudrue, G. Gibbs, S. Holmes, and E. Occella

ASSESSMENT OF THE ACTION OF ASBESTOS UNDER OCCUPATIONAL ENVIRONMENT CONDITIONS. *(RECOMMENDATIONS OF THE ASBESTOSIS SUBCOMMITTEE AFFILIATED WITH THE PERMANENT COMMITTEE AND INTERNATIONAL OCCUPATIONAL DISEASE ASSOCIATION). (Otsenka vozdeystviya asbesta v usloviyakh proizvodstvennoy sredy. (Rekomendatsii podkomiteta po asbestozu Postoyannogo Komiteta i Mezhdunarodnoy assotsiatsii po professionalnym zabolevaniyam)). Text in Russian. Gigiena i Sanit., no. 2:76-79, Feb. 1973. 4 refs.*

Recommendations by the Asbestosis Subcommittee affiliated with the Permanent Committee and International Occupational Disease Association on sampling conditions and methods of asbestos fiber determination, as well as on chemical characteristics of asbestos fibers are presented. Dust sampling by means of membrane filters, located in the respiration zone, should be applied to studies on the biological action of asbestos. Short sampling time for relative maximum concentrations, and prolonged sampling for averaged concentrations are needed. The effect of asbestos dust is assessed through counting asbestos fibers with a minimum length to diameter ratio of 3:1 for practical purposes under a light microscope. For assessment of the biological action, the particular type of asbestos should be determined, and the samples should be also investigated for the presence in them of biologically active metals, free silica content, and organic contaminants, such as aromatic polycyclic hydrocarbons in general, and benzo(a)pyrene in particular.

30147 **APTIC NO. 51830**

Lazorko, Lisa

NOW: AIR-QUALITY STANDARDS. *Chem. Eng., 80(8):28-29, April 2, 1973.*

The American Society for Testing and Materials has validated tests for measuring nitrogen dioxide, sulfur dioxide, settleable particulates (dust fall), total sulfation, suspended particulates (haze), and lead in ambient air. Measurements of the emissions of particulates, nitrogen oxides and sulfur oxides from industrial stack (stationary sources) is underway. Test methods will also be developed for ozone, oxidizing materials, hydrogen sulfide, mercaptans, inorganic fluorides, and formaldehyde. The A.S.T.M. is also planning to evaluate the accuracy of instruments for monitoring air pollutants and would include techniques for determining the chemical nature of particulates from ambient and stationary sources.

30148 **APTIC NO. 52211**

Leichnitz, K.

ANALYSIS/MONITORING/ENVIRONMENTAL PROTECTION. *(Analyse/Pruefung/ Umweltschutz). Text in German. Oel Gasfeuerung, 18(6):460-468, 1973.*

Some terms frequently connected with air pollution such as emission, emission source, temperature inversion, maximum allowable emission concentration and maximum allowable working place concentration are explained. for the determination of emisssions and ground level emissions measurements are necessary. The criteria according to which a certain analyzer is selected are reviewed. A brief description of the following measurement principles is given: conductivity, colorimetry, gas chromatography, infrared, gravimetric Orsat, and scrubbing. In conclusion, the test tube method for analyzing gases is briefly reviewed.

30149 **APTIC NO. 51917**

Lyon, W. S. and W. J. Ross (eds.)

DETERMINATION OF MERCURY AND OTHER ELEMENTS BY NEUTRON ACTIVATION. *In: Analytical Chemistry Division Annual Progress Report for Period Ending Sept. 30, 1972. Oak Ridge National Lab., Tenn., p. 33-34, Jan. 1973.*

NTIS: ORNL-4838

The determination of mercury by neutron activation analysis was discussed. Mercury was determined in fly ash, coal, sediment, fish, dry liver, tuna, wheat, flour, orchard leaves, dried blood, placenta, and hair by this technique. These were also analyzed by atomic absorption spectrometry, and results of both types of tests were compared. Results indicated good agreement. Other cooperative research programs are also listed.

30150 **APTIC NO. 51872**

Manita, M. D. and S. A. Akhmedova

ON THE QUANTITATIVE DETERMINATION OF THE ATMOSPHERIC TOTAL OXIDANT CONTENT. *(O kolichestvennom summarnom opredelenii oksidantov v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 3:78-80, 1973. 6 refs.*

A method for the calibration of the Cohen method for the qualitative determination of the atmospheric total oxidant content by means of Mohr s salt is presented. The oxidant determination is done by sampling air at a rate of 1 l/min through an absorbent solution composed of Mohr s salt, sulfuric acid, and distilled water. The red coloration obtained by the addition of ammonium rhodanide solution is evaluated photometrically. The calibration curve for the above determination is obtained by the use of air-ozone mixtures whose ozone content was previously determined iodimetrically. The ozone concentrations range from 0.71 to 0.96 mg/cu m. Following addition of standard solution of iron alum, photometric determination is performed in sulfuric acid instead of in nitric acid. It is not possible to replace ozone by an aqueous solution of hydrogen peroxide for calibration purposes. A ratio of 1:4 of the ozone concentration to the trivalent ion concentration was determined empirically. The optic density of the solutions is constant between 440 and 480 nanom.

30151 **APTIC NO. 51793**

Mannebeck, H.

A PORTABLE ODOR MEASURING INSTRUMENT FOR DIRECT MEASUREMENT. *(Ein tragbares Geruchsmessgeraet zur Direktmessung). Text in German. Landtechnik, 28(9/10):287-289, June 1973.*

An odor measuring instrument primarily for evaluating the odors of animal mass breeding stations is described. It is basically an oxygen or compressed air-operated breathing apparatus. A controllable flow of odorous ambient air is added to a constant oxygen or compressed air flow. Both odorous air and odorless breathing gas are adjustable in a wide range. The mixing ratio between breathing gas volume and ambient air volume can be changed between 0.2 and 1000. For operation of the unit the valve of the breathing gas bottle is opened, and at the pressure reduction valve the preliminary pressure is adjusted. The breathing gas volume flow is selected by adjustment of a certain nozzle pressure. The odorless gas is inhaled a few minutes before the odorous gas is added. Upon perception of the odor threshold the volume flow is read off the instrument. With the data for nozzle pressure and volume flow upon reaching the threshold value and with the nozzle cross section, the mixing ratio can be determined from the calibration diagram.

30152 **APTIC NO. 51987**

Marcus, Allan H.

AIR POLLUTANT AVERAGING TIMES: NOTES ON A STATISTICAL MODEL. *Atmos. Environ., 7(3):265-270, March 1973. 4 refs.*

The logarithmic standard deviation of time-averaged air pollutant concentrations was shown by CAMP (Continuous Air Monitoring Program) data to decrease as an inverse power B of the averaging time. If the correlation coefficient between the logarithm of the concentrations at distant times decreases as an inverse 2B power of the time difference, such behavior would be expected. This heavy-tailed correlation function suggests the existence of some possibly small, but highly persistent components of pollutant concentration. One possibility is that the observed process was not detrended. In order to test this hypothesis, it will be useful to calculate the average logarithm of the concentration instead of the logarithm of the average concentrations. (Author abstract)

30153 **APTIC NO. 51726**

Matsui, Hiroshi and Yoshikazu Yoshida

AEROSOL SAMPLING CONDITIONS IN EXHAUST SYSTEMS. *Text in Japanese. Nippon Genshiryoku Gakkaishi (J. At. Energy Soc. Japan), 15(3):165-173, 1973. 21 refs.*

To estimate accurately the concentration of radioactive aerosols in an exhaust system, the following factors that lead to errors in aerosol sampling must be known: the distance through the duct in which the aerosol mixes with air; anisokinetic sampling; and the fraction of aerosol deposited in the sampling pipe. Literature concerning correct sampling techniques is reviewed, and optimum sampling conditions are discussed.

30154 **APTIC NO. 51792**

Missfeld, B.

METHOD FOR THE DETERMINATION OF AGRICULTURAL ODOR EMISSIONS. *(Verfahren zur Ermittlung von landwirtschaftlichen Geruchsemissionen). Text in German. Landtechnik, 28(9/10): 284-285, June 1973.*

Odors can be determined by instruments which measure a certain characteristic substance, e.g., amines, hydrogen sulfide, mercaptans, carbonyls, and organic acids, or by organoleptic methods. The latter include the odor tests with groups of persons. Here age, sex, physical, and psychic condition are decisive for the evaluation of an odor. A representative cross section of the population is required since this kind of odor evaluation is very subjective. The human odor sense is capable of distinguishing between three to five odor intensity levels at the most. For further distinction of odor intensities, instruments are required. They pass certain adjustable quantities of odors to the nose. No such instrumental for agricultural emissions was available to date. Recently, however, an olfactometer specifically for the emissions from animal mass breeding stations has been developed. No description of the new olfactometer is given.

30155 **APTIC NO. 51772**

O Heare, J. N.

AIR QUALITY MEASUREMENT IN RELATION TO POWER STATION STACK EMISSIONS. *Clean Air, 7(1):14-17, Feb. 1973. 18 refs.*

The emission of power station flue gases as hot buoyant plumes from tall stacks results in emissions being reduced to low concentrations by the time they return to ground level. The measurement of these low concentrations necessitates adoption of special measuring techniques. Local meteorological measurements are an important supplement to air quality measurements, since the dispersion of emissions is governed by prevailing atmospheric conditions. Some of the more commonly used procedures for monitoring power station emissions (settling dust and gases) and for obtaining the supporting meteorological data are discussed, and current surveys being conducted by the State Electricity Commission of Victoria are briefly mentioned.

30156 **APTIC NO. 52299**

Okabe, Hideo, Paul L. Splitstone, and Joseph J. Ball

AMBIENT AND SOURCE SO2 DETECTOR BASED ON A FLUORESCENCE METHOD. *J. Air Pollution Control Assoc., 23(6):514-516, June 1973. 10 refs.*

The design and operation of an ambient and source sulfur dioxide detector are examined. The operating principle of the detector is based on the measurement of the intensity of the ultraviolet fluorescence of SO2 produced by absorption of the zinc 2138 A or cadmium 2288 A line. The fluorescence intensity was linear for 0.1-500 ppm of SO2 in air with the Zn lamp and for 0.1-1600 ppm with the Cd lamp. The detection limit was about 20 ppb. There was no detectable interference from ozone, hydrogen sulfide, nitrogen dioxide, carbon dioxide, carbon monoxide, or hydrogen but the presence of large concentrations of carbon disulfide, nitric oxide, or ethylene interfered with the measurement. The presence of 2% water reduced the signal by 25% while up to 1% methane had almost no effect. (Author abstract modified)

30157 **APTIC NO. 51889**

Oki[illegible] Toshiichi

MEASUREMENT OF AIR POLLUTANTS. *(Taiki osenbutsu no sokutei). Text in Japanese. Nippon Rinsho (Japan. Clin.), 31(6):1971-1976, June 1973.*

The accuracy of the conductometric analysis for sulfur dioxide is discussed. For low SO2 values, other pollutants can affect the measured SO2 concentration. The influence of atmospheric pressure at the sampling opening on the chemiluminescent analysis of ozone is discussed. The Saltzman method is used to measure nitrogen oxides; however there is the possibility that nitrogen dioxide is changed into nitric oxide in the absorption pipe, thus altering the accuracy of the method. Methods for measuring carbon monoxide and hydrocarbons are also mentioned.

30158 **APTIC NO. 52049**

Pich, Josef

THEORY OF GRAVITATIONAL DEPOSITION OF PARTICLES IN FIBROUS AEROSOL FILTERS. *Aerosol Sci., 4(3):217-226, 1973. 13 refs. (Presented at the All-Union Conference, on Aerosol Application in National Economy, 2nd, Odessa, USSR, Sept. 25-29, 1972.)*

Based on the concept of solenoidal force fields, a theory of gravitational deposition of Stokes particles from flowing fluid on cylinders and in fibrous filters is developed. The theory is presented for arbitrary values of the angle between the direction of fluid flow (potential or viscous) and that of the gravity field; simultaneously, the finite size of depositing particles (direct interception) is taken into account. The result is expressed in generalized variables (Friedlander s) suitable for correlating experimental data. The angular distribution of deposited particles on the fiber surface is described, and equations are derived describing the mechanisms of gravitational deposition and direct interception of particles in fibrous aerosol filters. The theory is in qualitative agreement with available experimental data. (Author abstract modified)

30159 **APTIC NO. 52499**

Pittke, E. Ch., Georg Schoffa, and Michael Birkle

GAS ANALYSIS BY PARAMAGNETIC RESONANCE. *(Gasanalyse mit paramagnetischer Resonanz). Text in German. Messtech., 81(3):77-83, March 1973. 18 refs.*

The applicability of paramagnetic resonance to quantitative analysis of nitric oxide, nitrogen dioxide, and oxygen was investigated. The sensitivity limits attainable and the corresponding pressure, microwave output, modulation amplitude, and frequency range were studied. The sensitivity of the method for a gas is expressed by the S/N ratio (signal/noise) attainable at a given gas concentration. The detection threshold for NO2 at an S/N ratio of 1 was around 20 ppm. This value can be improved by enlargement of the measuring volume or by raising the modulation amplitude. The detection threshold for oxygen in nitrogen is about 500 ppm at S/N equals 1. For nitric oxide the threshold is approximately 1% by volume at S/N equals 1, which can be improved at higher pressures by increasing modulation amplitude. Currently the method can be used only for emission monitoring. In the case of NO2, the method can successfully compete with the standard photometric method, but for NO the sensitivity is so low that satisfactory sensitivity by this method can be achieved only by oxidizing NO to NO2.

30160 **APTIC NO. 52031**

Popov, V. A.

METROLOGICAL TASKS IN THE AIR POLLUTANT MEASUREMENT FIELD. *(Metrologicheskiye zadachi v oblasti analiza atmosfernykh zagryazneniy). Text in Russian. Gigiena i Sanit., no. 2:80-83, Feb. 1973. 6 refs.*

Problems of the preparation of reference standards for concentration measurements of pollutant gases and vapors in the atmosphere, and of the evaluation of the precision of analytical methods and instruments are discussed. Primary gas standards, the composition of which is determined by the process of their preparation, and known from the metrological characteristics of the dosaging unit, are necessary for the evaluation of the precision of analytical methods for air pollution studies. The inherent error of the analytical method can be evaluated by the use of a gaseous mixture composed of polluted air as carrier gas with known amount of a given pollutant added. The allowable error of analytical methods and instruments should be set with respect to the hygienic and economic consequences of such errors in the determination of maximum allowable concentrations, in space management, and in the elaboration of requirements on stack heights and pollution control device efficiency.

30161 **APTIC NO. 52422**

Quessette, Jacques-Alain and Joseph M. Ajello

A ROCKET-BORNE INSTRUMENT FOR THE MEASUREMENT OF NIGHTTIME ATMOSPHERIC DENSITIES. *Rev. Sci. Instr., 44(6):685-688, June 1973. 3 refs.*

A rocket instrument was designed for the determination of nighttime atmospheric densities by means of resonant scattering. By illuminating the atmosphere with an intense parallel beam of light at the resonant wavelength of an atmospheric gas and observing the back scattering, either relative or absolute densities can be determined. The design, principle of operation, calibration, application, and preliminary results of field tests are reviewed. The instrument can be used to detect the spectra of atomic oxygen and nitric oxide. (Author abstract modified)

30162 **APTIC NO. 51831**

Richter, Juergen H., Douglas R. Jensen, V. Ray Noonkester, Joseph B. Kreasky, Michael W. Stimmann, and Wayne W. Wolf

REMOTE RADAR SENSING: ATMOSPHERIC STRUCTURE AND INSECTS. *Science, 180(4091):1176-1178, June 15, 1973. 4 refs.*

A high-resolution radar sounder was used in the simultaneous detection of atmospheric structure and insects. The vertical distribution of insects was often correlated with atmospheric structure. Continuous recordings revealed diurnal fluctuations and layering of insects at various altitudes. The result suggest that the frequency-modulated, continuous-wave radar is capable of simultaneously sensing insects and atmospheric structure, and that insect flight is influenced by atmospheric structure. Correlations between atmospheric structure and insect activity were detected in both arid and humid locations. Remote radar sensing can also be used to measure pollution. (Author abstract modified)

30163 **APTIC NO. 52046**

Ripley, E. A., B. Saugier, and O. J. Olm

A CONTROL AND READOUT SYSTEM FOR THE MEASUREMENT OF ATMOSPHERIC CO2 PROFILES WITH A DIGITAL DATA LOGGER. *J. Phys. E., 6(2):183-185, Feb. 1973. 2 refs.*

A device is described which uses a conventional digital data acquisition system to control the switching of a six-level atmospheric carbon dioxide sampling system. The CO2 concentration, as measured by an infrared gas analyzer, is digitized, stored, and automatically read into the data logger. Although the circuitry is not simple, the system has proved efficient and reliable in field operation. The total parts cost, exclusive of retransmitting slidewire and solenoid valves, is on the order of $600. The system was designed to study the exchange of CO2 between the atmosphere and vegetation but could equally well be used for analysis of water vapor and other gases. (Author abstract modified)

30164 **APTIC NO. 51997**

Robinson, J. W. and Y. E. Araktingi

STUDY OF THE APPLICATION OF ATOMIC FLUORESCENCE SPECTROMETRY TO THE DIRECT DETERMINATION OF MERCURY AND CADMIUM IN THE ATMOSPHERE. *Anal. Chim. Acta, 63(1):29-38, Jan. 1973. 25 refs.*

An attempt was made to use atomic fluorescence as a technique for the direct determination of mercury and cadmium in the ambient atmosphere. A hot carbon bed was used for the reduction of metals to free atoms. In the system used, air was transformed to a mixture of 67% nitrogen and 33% carbon monoxide. The high concentrations of these quenching agents greatly reduced the fluorescence intensity of mercury or cadmium. The weak fluorescence signals obtained could not be amplified sufficiently to generate a useful analytical signal, even though atomic absorption signals showed that there was a substantial atomic vapor present in the cell. Carbon monoxide formed in the bed acted as a severe quenching agent, and nitrogen also was a quenching agent, although less severe. This changed the sensitivity of the technique to concentration levels above that normally encountered for these metals in air. The technique is unsuitable for the direct determination of metals in air.

30165 **APTIC NO. 51735**

Rodes, Charles E., Richard M. Felder, and James K. Ferrell

PERMEATION OF SULFUR DIOXIDE THROUGH POLYMERIC STACK SAMPLING INTERFACES. *Environ. Sci. Technol., 7(6):545-549, June 1973. 9 refs.*

Preliminary developmental studies on the use of a cylindrical polymeric tube as a permeable interface between a stack and a continuous ambient sulfur dioxide monitor were carried out under controlled laboratory conditions. Isothermal sulfur dioxide trans-wall flux measurements were made over a range of concentrations of sulfur dioxide in air at several temperatures, using teflon, silicone rubber, and fluorosilicone rubber tubes. The flux varied linearly with the trans-wall concentration gradient in all cases. The activation energies in kcal/g-mol for permeation of sulfur dioxide were 7.0 for teflon, 0.94 for the silicone rubber, and 1.33 for the fluorosilicone rubber. The relaxation times, or times required for the fluxes to reach steady-state values following changes in operating conditions, were on the order of minutes for each material. The results of these preliminary studies indicate that the polymer tube interface is a promising device for stack monitoring. (Author abstract)

30166 **APTIC NO. 52506**

Rollet, M. and M. Moisson

PROCEDURE FOR THE DETERMINATION OF ORGANIC COMPOUNDS POSSIBLY PRESENT IN THE ATMOSPHERE. *(Mise au point d un procede d etude des composes organiques eventuellement presents dans les atmospheres). Text in French. Pollut. Atmos. (Paris), 15(57):33-43, Jan.-March 1973. 7 refs.*

A simple and fast method for the assessment of organic chemical compounds present in the atmosphere in trace quantities is outlined. A sample of atmospheric air is taken by passing a known quantity through a tube filled with activated charcoal held in at both ends by glass wool stoppers. The compounds adsorbed on the carbon are elutriated by a solvent, the eluate is subjected to gas chromatography, and identification of the individual compounds is accomplished by association of gas chromatography and mass spectrometry which is highly effective on the condition that the excellent chromatographic separation has been achieved. Elutriation can be performed either by a single operation using 37.5 ml acetone or by elutriating separately 20 to 50 g quantities of activated carbon from both ends of the tube. This method possesses two advantages, it yields a control reading on condition that effective adsorption from carbon in the rear end of the tube has been achieved in the front zone of carbon in the tube, and it requires a smaller volume of acetone; the method is however quantitatively less accurate. Either can be used for extraction, but in some cases the chromatogram with either is less reliable. Test runs of the method were conducted with small quantities of menthol, eucalyptol, ionone, and geraniol, with samples of the atmosphere from industrial zones, from traffic congested streets, and from rural districts. Each type of air yielded characteristic chromatograms whose evaluation was made possible by the association with mass spectrometry.

30167 **APTIC NO. 52206**

Rooth, R., O. K. Bockman, K. O. Hagen, and A. Tokerud

MEASUREMENT OF FLUORINE EMISSION FROM ALUMINUM SMELTERS--A NEW AND MORE CORRECT METHOD. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 327-340, 1973. 1 ref. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-23.)*

Most methods for sampling the fluoride content of fumes from aluminum smelters are unsatisfactory since the sampling trains are not equipped to collect submicron particulate fluorides. Improved sampling equipment has the ability to determine separately gaseous fluorine, coarse particulate fluorides, and fine particulate fluorides. In addition, particle size distribution can be evaluated. The sampling train for gas and dust includes a replaceable probe nozzle, a heating and cooling device, two cyclones for the collection of coarse particulates, a cellulose nitrate filter for collection of fine particulates, and absorption bottles for hydrofluoric acid. After sampling, concentrations are determined through weighing and analyses in the laboratory. In addition to the probe nozzle, cyclones, and filter, the equipment for particle size distribution includes a miniature electrostatic precipitator on which submicron dust is deposited. Collecting electrodes provide direct introduction into scanning or electron microscopes. The equipment is valuable for predicting the factors that affect wet scrubber performance. A correlation between scrubber pressure loss, cleaning efficiency for total fluorides, and raw gas composition is presented.

30168 **APTIC NO. 51840**

Saeki, Masao, Koichi Nishisaka, and Motoshige Iwamoto

EFFECTS OF NITROGEN OXIDES ON A CONDUCTOMETRIC ANALYSIS OF SULFUR DIOXIDE IN ATMOSPHERE. *(Yoeki dodenritsu-ho ni yoru taikichu io sankabutsu no bunsekiho ni okeru chisso sankabutsu no eikyo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(6):773-775, June 1973. 7 refs.*

To determine the effect of nitrogen oxide on the conductometric analysis of sulfur dioxide in the air, experiments were conducted with samples of nitric oxide or nitrogen dioxide diluted with pure nitrogen gas. The existence of NO at a mass ratio higher than 0.012 ppm or NO2 at a mass ratio higher than 0.07 ppm caused an error of over 0.001 ppm in SO2 analysis, and the error increased with decreasing temperature. The error can be corrected by determining the nitric acid in the absorbing solution and by subtracting its contribution from the total conductance.

30169 **APTIC NO. 51860**

Sato, Tadashi, Noriko Yamamoto, Hajime Ohara, and Saburo Yanagisawa

DETERMINATION OF PHOSPHORUS(III) AND (V). AND ORGANIC PHOSPHORUS COMPOUNDS IN AUTOMOBILE EXHAUST. *(Jidosha haigasu-chu no rin (III), (V) oyobi yuki rinkabutsu no teiryo). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 22(5):600-602, May 1973. 1 ref.*

The method for determining phosphorus (III) and (V) and mixtures of organic phosphorus in automobile exhaust was studied. To determine phosphorus by colorimetry with molybdenum blue, it should be in the orthophosphate state. Phosphorus (III) and organic phosphorus can be quantitatively oxidized to this state with ammonium persulfate in hydrochloric acid. The organic phosphorus compounds in the presence of inorganic compounds are extracted into ethyl acetate; the phosphorus (III) remaining in the aqueous phase is oxidized; and the sum of phosphorus (III) and (V) is determined as orthophosphate. By determing the orthophosphate contents in three aliquots taken from the sample, the amounts of the three forms of phosphorus are calculated from the differences of the values obtained without oxidation, by oxidation with ammonium persulfate in hydrochloric acid, and by oxidation of phosphorus (III) after the extraction of the organic phosphorus.

30170 **APTIC NO. 52033**

Slutsker, A. S.

EVALUATION OF THE PRECISION AND RELIABILITY OF DUST CONCENTRATION MEASUREMENTS PERFORMED BY THE GRAVIMETRIC PROCEDURE. *(Otsenka tochnosti i dostovernosti izmereniy kontsentratsii pyli pri vesovom metode opredeleniya). Text in Russian. Gigiena i Sanit., no. 2:61-65, Feb. 1973. 3 refs.*

Problems of the precision and reliability of dust concentration measurements performed by the gravimetric procedure are discussed. The variations of the dust concentrations measured gravimetrically by means of AFA-V type filters are subject to standard distribution. The magnitude of the error involved in the measurements performed for general hygienic studies is + or 30% but it can be reduced to + or 20%. With errors of + or - 20% or less, the use of single samples is acceptable. Samples weighing less than 1 mg sharply reduce the precision of the concentration measurement. The control of the precision of dust concentration measurements requires at least 32 pairs of samples.

30171 **APTIC NO. 51900**

Soole, B. W.

THE EFFECT OF FILAMENT REYNOLDS NUMBER UPON THE EFFICIENCIES OF ROTARY IMPACTION FILTERS. *Aerosol Sci., 4(2):171-178, March 1973. 14 refs.*

A detailed analysis of measurements made of the filtration efficiencies of 15 rotary impaction filters shows that the penetrations of the filters are, at constant Stokes number, inversely related to the filament Reynolds number, so that residual penetrations may be reduced not only by increasing the Stokes number but also by increasing the filament Reynolds number. In particular, results with iso-Stokes filters (filters with filaments tapered to the centre of rotation) show good agreement with published experimentally determined impaction efficiencies for wires at comparable Reynolds numbers. Comparison with theoretical values, however, shows that at high filament Reynolds numbers, efficiencies are significantly greater than those predicted for particles moving even in ideal potential flow, a difference interpreted as showing that the boundary layer around the filter filaments is of significance in trapping particles approaching at grazing incidence. (Author abstract)

30172 **APTIC NO. 52073**

Stephens, Edgar R. and Monty A. Price

ANALYSIS OF AN IMPORTANT AIR POLLUTANT: PEROXYACETYL NITRATE. *J. Chem. Educ., 50(5):351-354, May 1973. 13 refs.*

Peroxyacyl nitrates are a family of compounds present in photochemical smog that are extremely toxic to vegetation. The compound that has received the most attention is peroxyacetyl nitrate (PAN). Gas chromatography with electron capture detection provides a very sensitive and selective method for the measurement of PAN in polluted air, and can routinely measure concentrations below 10 ppb. For calibration purposes, small quantities of PAN are best generated by the photolysis of ethyl nitrate in oxygen. The chromatographic procedure and the preparation of the calibration mixture are described in detail.

30173 **APTIC NO. 51828**

Stevens, D. C. and W. L. Churchill

A HIGH FLOW RATE SIZE SELECTIVE ENVIRONMENTAL SAMPLER THAT CONFORMS TO THE LUNG MODEL PROPOSED BY THE I.C.R.P. TASK GROUP ON LUNG DYNAMICS. *Aerosol Sci., 4(2):85-91, March 1973. 6 refs.*

A high flow rate (35.1 l/min) size selective dust sampler is described which has a particle size deposition curve nearly identical to that proposed for the pulmonary compartment of the lung by International Commission on Radiological Protection Task Group on Lung Dynamics. The particle size deposition curve of the high flow rate sampler is given, and the method of calibration using monodisperse polystyrene particles is described. The results of the measurement of airborne radioactive material by the sampler in a decontamination area are reported to illustrate the type of information that can be obtained. The design of the sampler allows a considerable amount of flexibility in the choice of separation characteristics, and it is believed that the sampler could be modified to conform to any future changes in lung model deposition curves. (Author abstract modified)

30174 **APTIC NO. 52270**

Thuermer, H.

GRAVIMETRIC DUST SAMPLING UNIT. *(Gravimetrisches Staubsammelgeraet). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 19(1):47-49, 1973. 6 refs.*

The basic requirements for dust measurement on the basis of two-stage gravimetry are discussed. The equipment for such measurements must comprise a preliminary separator whose collection characteristic corresponds to the dust retention in the upper respiratory tract of humans. An internationally acknowledged characteristic must be followed closely. The following fine dust collector must collect 95% of the respirable dust. The flow resistance must be small and must remain constant. A set-up which fulfills all these demands is illustrated and described. The air samples are drawn through a slot into the cyclone where all coarse dust is separated. Through the cyclone outlet tube the air flow passes into fine dust collector which is a flat plastic dish with a metal lid holding an annular cloth filter with very little flow resistance. The air passes the filter radially from outside to inside. By means of an annular electrode between the bottom of the filter casing and the grounded lid an electric field is produced of 6 to 7 kV/cm. The air throughput is 9 cm m/hr. The fine dust filter is capable of retaining about 0.5 to 1 g dust without reducing the air throughput markedly.

30175 **APTIC NO. 51795**

Van Grieken, R. and R. Dams

DETERMINATION OF SILICON IN NATURAL AND POLLUTION AEROSOLS BY 14-MEV NEUTRON ACTIVATION ANALYSIS. *Anal. Chim. Acta, 63(2):369-381, Feb. 1973. 21 refs.*

The determination of silicon via the 28-Si(n, p)28-Al reaction by means of 14-MeV neutrons is applied to the analysis of man-made and natural aerosols. A Whatman 41 filter (40 sq. cm.) on which airborne particulate material has been collected is compressed into a 3 by 12.7 mm pellet. Standards are prepared in the same way from clean filters spiked with a silicate solution. After a 50-second irradiation and 75-second delay time, the sample is counted for 2 min with 5 by 5 in. sodium iodide (Thallium) well detector. The reproducibility, sensitivity, and liability to interference from other elements were investigated for both counting systems. The homogeneity of the pellets and the filters was checked. The overall precision of one single-channel determination was estimated to be 3.5% after a 24-hour high-volume sampling time. Samples collected in urban, industrial, and remote areas with concentrations ranging from 0.05 to 15 micrograms Si/cu m air were analyzed, and the results are discussed. (Author summary modified)

30176 **APTIC NO. 51941**

Villalobos, R. and E. A. Houser

ON-LINE ANALYSIS OF SO2 IN FLUE GAS AND OTHER PROCESS STREAMS BY GAS CHROMATOGRAPHY. *ISA (Instr. Soc. Am.) Trans., 12(1):70-77, 1973. 7 refs. (Presented at the Instrument Society of America, Analysis Instrumentation Symposium, 18th, May 3-5, San Francisco, Calif.)*

Process gas chromatographs with conventional thermal conductivity detectors provide automatic measurements of sulfur dioxide and hydrogen sulfide over a wide range of concentrations. This technique is especially useful if other sample constituents interfere or must be measured simultaneously, or if wide dynamic range is required. Applications with these requirements include measurement of SO2 in recovery plant feed and off-gas; measurement of SO2 and other sample components (e.g., carbon dioxide and oxygen) in recovery process feed and off gas; and measurement of SO2 and H2S in gas streams of a Claus sulfur recovery plant with an SO2 recovery process. Single and parallel column configurations and sampling handling requirements are discussed. (Author abstract modified)

30177 **APTIC NO. 52426**

Wang, T. P. and A. Brockhaus

COLUMN CHROMATOGRAPHIC SEPARATION AND GRAVIMETRIC DETERMINATION OF ALIPHATIC AND AROMATIC HYDROCARBONS IN THE AEROSOL OF LARGE TOWNS. *(Saeulenchromatographische Trennung und gravimetrische Bestimmung der aliphatischen und aromatischen Kohlenwasserstoffe im Grossstadtaerosol). Text in German. Zentralbl. Bakteriol., Parasitenk. Infektionskr. Hyg.: Abt I: Orig., Reihe B, 157(2-3):145-150, 1973. 5 refs.*

A method for the determination of the aliphatic and aromatic hydrocarbons in atmospheric aerosols by column chromatography is described. A chromatographic pipe (100 cm/1.6 cm) contains several ml of solvent consisting of cleaned silica gel and a mixture of n-hexane and n-heptane (mixing ratio 1 to 9). The sample of 100 mg substance is added, and the first fraction containing aliphatic hydrocarbons is elutriated. At the same time the polycyclic compounds have reached only the middle of the column. For acceleration of the elutriation of these compounds, a mixture of cyclohexane-benze (ratio 8 to 2) is used. The end of this fraction is indicated by the occurrence of coronen. The procedure was applied to hexane extracts of aerosol samples taken in summer 1969 and winter 1969/1970 in Bochum and Duesseldorf. The respirable aerosols were sampled with membrane filters after separation of the large aerosols of more than 5 micron with a cyclone. The analytical results indicated that the first fraction contains the aliphatic hydrocarbons. A clean cut separation of these organic components was feasible. In the second fraction of primarily aromatic hydrocarbons, aliphatic groups could be determined by infrared spectroscopy. In both cities, fraction two with aromatic compounds was markedly lower in summer in favor of the polar compounds.

30178 **APTIC NO. 51817**

Wentworth, W. E. and R. R. Freeman

MEASUREMENT OF ATMOSPHERIC NITROUS OXIDE USING AN ELECTRON CAPTURE DETECTOR IN CONJUNCTION WITH GAS CHROMATOGRAPHY. *J. Chromatog., no. 79:322-324, May 16, 1973. 9 refs.*

Atmospheric nitrous oxide is measured using electron capture detector (ECD) in conjunction with gas chromatography. The experimental apparatus is discussed. Results indicate that at high temperatures (350 F) this technique could be used to quantitatively measure the concentration of N2O in the ppb range, if the temperature dependence of the capture coefficient remains linear at high temperatures. Use of the ECD eliminates the need for a concentration technique, thereby reducing the time of analysis and excessive sample manipulation. The procedure is straighforward and is suitable for use in the field. The sensitivity of the ECD to N2O is 1000 times less at 20 than at 400 F. This illustrates that the ECD can be used to detect N2O in the atmosphere, and it simplifies a complex analytical problem.

30179 **APTIC NO. 52113**

Yanagihara, Shigeru

TECHNIQUE OF PREVENTING AUTOMOBILE EXHAUST GAS POLLUTION AND THE TRANSDUCER. *(Jidosha haiki no kogai boshi gijutsu to toransujusa). Text in Japanese. Keisoku to Seigyo (Meas. Control), 12(1):61-69, Jan. 1973.*

Analytical methods to analyze automobile exhaust gases are described, and the role of the transducer as related to cleaning automobile exhaust gas is explained. Non-dispersive infrared spectrophotometry is used to analyze exhaust gases including carbon monoxide and carbon dioxide. As a non-dispersion infrared analyzer using radioactive isotopes, an analyzer to detect and determine the concentration of CO(16) is used. The hydrogen flame ionization detector is used to determine hydrocarbons and CO. The chemiluminescence method is used to determine nitric oxide, nitrogen oxides, or ozone.

30180 **APTIC NO. 52141**

Yatabe, T.

ANALYTICAL METHOD OF NITROGEN OXIDES IN EXHAUST GAS. *(Haigasu chu no chissosankabutsu no bunseki hoho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(4):22- 33, April 1973. 18 refs.*

Problems and improvements of the Saltzman and phenol disulfonic acid methods for analyzing nitrogen oxides in boiler exhaust gases are discussed. The Saltzman (naphthylethylene diamine) method gives low nitric oxide values when air is used as an oxidizing reagent and only 2 hours are allowed for oxidation of NO. Oxygen should be used instead of air. Sulfur dioxide in the sample also gives low NO values, because of the SO2 reducing action. Exhaust gas must be passed through an absorbent containing hydrogen peroxide to eliminate SO2 before sampling. After eliminating these problems, the NO value is 1.3-1.4 times the real value; the produce yield of nitrate might be assumed to be 0.65-0.7, but not 0.5, in the case of boiler exhausts. Nitric oxide is not completely absorbed into the standard H2O2 solution, even though it is contacted with the solution overnight, in the phenol disulfonic acid method. This method is the primary standard method. Coexisting SO2 consumes the H2O2, giving a lower NO content. To solve these problems, H2O2 concentration must be increased to 0.3%, 10 times the usual concentration. Actual inner pressure must be measured before sampling. The Saltzman method can also be used for nitrogen dioxide analysis. However, remaining NO in the absorbent bottle can be oxidized to give an erroneously high NO2 value. The NO must be completely purged by nitrogen. If the NO/NO2 ratio of the sample is large, 3-4 times larger NO2 values are obtained. Carbon dioxide in the sample is absorbed into the sodium hydroxide solution giving apparently higher gas volumes. To solve these problems, the Saltzman solution must be used instead of the conventional absorbent, and the product yield of nitrate should be assumed to be 0.72.

30181 **APTIC NO. 52152**

Yatabe, Teruo

ANALYTICAL METHODS FOR NITROGEN OXIDES IN FLUE GASES. *(Hai gasu-chu no chisso sankabutsu no bunseki hoho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(4):22-33, April 1973. 18 refs.*

Various standard analytical methods for nitrogen oxides in fuel combustion gases and boiler flue gases are reviewed, their problems pointed out, and improvements suggested. In the naphthylethylene diamine (NEDA) method (Saltzman), improvements can be made by replacing 2 hr of air oxidation with 2 hrs of oxygen oxidation. The test gas should be sampled after eliminating sulfur dioxide completely, placing a hydrogen peroxide absorption jar in front. The nitrate ion formation rate can be determined by comparing the improved NEDA method and the phenol disulphonic acid method and by using it for calculation. The phenol disulphonic acid (PDS) method can be improved by increasing the H2O2 concentration in the absorbent by 10 times, or to 0.3%, improving oxidation. The pressure inside the flask should be measured immediately before sampling. The NEDA method for nitrogen dioxide can be improved by purging nitric gas in the absorption jar by nitrogen gas. The actual measurement and theoretical measurement will agree by changing the absorption liquid with the Saltzman reagent and by making the formation rate of nitrate ion 0.72.

1972

30182 **APTIC NO. 51931**

Ministry of International Trade and Industry (Japan), Research Coordination Bureau

REPORT OF SPECIAL RESEARCH CONCERNING DEVELOPMENT OF LASER RADAR FOR MEASUREMENT OF AIR POLLUTANTS. *(Taikiosenbutsu sokuteiyo reza reda no kaihatsu ni kansuru tokubetsukenkyu hokokusho). Text in Japanese. 70p., June 1972. 11 refs.*

A lidar system is described which can be used to measure sulfur dioxide and carbon monoxide. Scattering and reflection characteristics of suspended particulates were studied with a single wavelength laser radar in order to determine optimum specification values such as transmitting power and receiving sensitivity which would be used in designing the new lidar equipment for the measurement of suspended particulates. Atmospheric distribution of various substances was observed by a helicopter equipped with various analyzers so that the effective measuring range of the lidar could be determined. The transmitting/receiving section, signal converter section, and data analysis section of the prototype lidar system were designed. Reshaping of transmitted pulse, digital quantitative analysis of received pulse, and effects of solar radiation and miscellaneous lights were also studied.

30183 **APTIC NO. 51870**

Belyayev, S. P. and K. P. Makhonko

METHODS FOR REPRESENTATIVE SAMPLING OF ATMOSPHERIC AEROSOLS. *(Metody reprezentativnogo otbora prob atmosfernykh aerozoley). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):40-56, 1972. 20 refs.*

Theoretical considerations on representative sampling of atmospheric aerosols are presented, and aerosol samples developed on such principles are described. Isokinetic sampling is regarded as the only possible means of obtaining representative aerosol samples at high wind speeds. The suction coefficient is near unity under isokinetic sampling conditions. Small, high-frequency fluctuations in the wind velocity around its mean value have little influence on the value of the suction coefficient. Formula for the calculation of time-averaged suction coefficients for high-frequency fluctuations in the wind velocity is given. A reliable filtering sampler, securing representative aerosol sampling by maintaining isokinetic conditions through balancing pressures as a function of wind speed, was developed. A constant suction rate of 5 m/sec is maintained for isokinetic sampling at wind speeds below 5 m/sec, and a suction rate of 15 m/sec is applied for wind speeds exceeding 15 m/sec. Another instrument, a dust rhumbometer, permits determination of dust quantities carried by winds of different directions, and the calculation of the advection of dust masses. The rhumbometer has six electrostatic dust separators in as many segments for nearly quantitative dust separation.

30184 **APTIC NO. 52504**

Castello, G., G. Novari, and F. Pedemonte

GAS CHROMATOGRAPHIC ANALYSIS OF GASOLINE AND ALIPHATIC CHLORINATED HYDROCARBON MIXTURES. *(Determinazione gascromatografica di miscele di benzine ed idrocarburi clorurati alifatici). Text in Italian. Rass. Chim., 24(6):367-375, Nov.- Dec. 1972. 25 refs.*

A gas chromatographic method was designed to separate and determine individual components from gasoline-chlorinated hydrocarbons- aromatic hydrocarbons mixtures. Separation is accomplished either by microdistillation at reduced pressure, by distillation at atmospheric pressure, or by distillation in a current of steam. In the first case the solvent collected is directly injected into the gas chromatograph which successively identifies the individual components of the mixture on the basis of their retention times and determines them quantitatively with the help of correction factors. In the case of the other two distillation methods, the Ashton method is applied designed to remove oxygenated solvents of various types which could interfere with gas chromatography. The Ashton procedure consists of a four-step washing procedure with water, sulfuric acid, and phosphoric acid. Experiments and theoretical considerations have shown that in order to obtain satisfactory separation of individual chlorinated hydrocarbons and of gasoline, a stationary phase possessing high polarity is indicated. Suitable for this purpose is tetracyan-ethyl-pentaerythritol which has a very low affinity for paraffins and olefins combined with a high selectivity in the case of aromatic hydrocarbons. The operating conditions of the column and retention times of various chlorinated and aromatic hydrocarbons in relation to methylene, chloroform, benzene, and n-paraffins on the TCEPE column at 40 C are listed; the retention times make possible the qualitative identification of individual chlorinated hydrocarbons. The separation of the dichloroethane-dichloropropane couple with which the theoretical number of column plates used is not resolved can be accomplished separately by using a longer column.

30185 **APTIC NO. 52223**

Deslandes, J. V. and H. C. Watson

MEASUREMENT OF ATMOSPHERIC POLLUTION FROM MOTOR VEHICLES BY GAS CHROMATOGRAPHY. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 281-286. 10 refs. (May 15-18.)*

Exhaust gases from spark ignition and diesel engines and atmospheric carbon monoxide and hydrocarbon concentrations in Melbourne were analyzed by gas chromatography. Spark ignition engine exhaust was separated on a 0.9 m molecular sieve column at 20 C. The sensitivity was more than adequate for carbon monoxide, hydrocarbons, and carbon dioxide, but the lower detectability limit for nitric oxide was 100 ppm. Carbon monoxide and NO in diesel exhaust were separated on a 3.7 m Porapak Q column at -79 C. The sensitivity for CO detection was adequate, but the lower limit for NO detection was 150 ppm. A method which shows promise for nitrogen dioxide analysis in diesel and spark ignition exhaust gas is a 1.2 m Porapak Q column at 20 C. Total HC determination with a flame ionization detector is preferably performed without prior separation, so a separate analysis is required. Carbon dioxide analysis is conveniently achieved on a 3.7 m Porapak Q column at 20 C in a separate analysis. Atmospheric CO and HC concentrations were determined simultaneously by combining a thermal conductivity detector and a flame ionization detector in series. Carbon monoxide and HC concentrations recorded at city intersections during peak traffic hours averaged 9 ppm and 14 ppm, respectively.

30186 **APTIC NO. 52402**

Downs, W. and S. S. Strom

NEW PARTICLE SIZE MEASURING PROBE--APPLICATION TO AEROSOL COLLECTOR AND EMISSIONS EVALUATIONS. *J. Eng. Power, 94(2):117-126, April 1972. 8 refs. (Presented at The American Society of Mechanical Engineers, Winter Annual Meeting, Washington, D. C., Nov. 28, 1971-Dec. 2, 1971, Paper 71-WA/PTC-7.)*

A basic parameter needed for judicious design, selection, and regulation of industrial gas cleanup equipment is particle size distribution of gas-borne emissions. Despite the importance of this parameter, a cloud of uncertainty about the validity of present methods used for particle size distribution measurements has produced a technological gap. An apparatus and method which is capable of bridging this gap is described. Particle size distribution data obtained, particularly in the near micron and submicron range, can provide a means for determining grade efficiencies of dust collectors, expected opacity of stack emissions, and dispersion characteristics of plumes. The apparatus was developed for manual sampling and size distribution determination of aerosols within industrial flues and stacks. The entire apparatus is contained within a sampling probe. The principal component is a cylindrical cascade impactor. Design of the probe eliminates most of the technical difficulties associated with previous attempts at implementing cascade impactors to this task. This probe has been used successfully for sampling gases up to 450 F. (Author abstract)

30187 **APTIC NO. 52253**

Evans, John R.

A SOLID SAMPLER WITH SINGLE SAMPLE LEADING FOR GAS CHROMATOGRAPHY. *Clin. Chim. Acta, vol. 37:289-291, March 1972. 5 refs.*

A sampler for introducing solid samples into a gas chromatograph was designed to load one sample at a time so that the choice of the composition of the next sample could be changed after the completion of the previous chromatogram. The sampler was made of brass with a stainless steel cone, and the sample tubes were made from one-mm-diameter Pyrex tubing. In general, solid sample injection gave a slightly higher response with a smaller standard deviation than either on-column or flash-heater injection.

30188 **APTIC NO. 52291**

Foster, Willis B., Robert F. Holmes, and John D. Koutsandreas

REMOTE SENSING FOR ENVIRONMENTAL MONITORING. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 15p., 1972. 6 refs. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

The role of the Environmental Protection Agency in the development and use of remote sensors for monitoring is outlined. Present EPA capabilities include reliable sensors or systems such as chemiluminescence, gas chromatography, and integrating nephelometers for detecting ambient levels of stack gases and particulates. Work on automated contact sensors has led to a program which uses sensors in tandem with a data relay system to monitor water quality in the Greater Miami River. In Oregon, an aerial photography study of dispersion of wastes from ocean outfalls uses photography as an energy sensor. Other EPA programs using remote sensors are the National Lake Eutrophication Survey, the Oil Spill Detection and Prevention Program, and the Oil Spill Surveillance Program. Additional research and development is needed to establish effective monitoring programs in the following areas: the fate of pollutants in fresh and marine waters; oil and hazardous materials spills, mining pollution; land use; agricultural and solid waste pollution; air degradation; and pesticides concentrations. Highly accurate tuned laser systems may be available for some of these monitoring applications by the mid 70 s.

30189 **APTIC NO. 52005**

Gordon, B. M. and H. W. Kraner

ON THE DEVELOPMENT OF A SYSTEM FOR TRACE ELEMENT ANALYSIS IN THE ENVIRONMENT BY CHARGED PARTICLE X-RAY FLUORESCENCE. *J. Radioanal. Chem., 12(1):181-188, Oct. 1972. 11 refs.*

A charged particle x-ray fluorescence technique is applicable to many types of samples, including plant tissue, animal tissue, soil, water, air, consumer products, and lunar samples. The technique would be particularly advantageous in cases where only small samples are available or a trace element distribution within a sample is desired. It does not require chemical preparation with the attendant possibility for losses or contamination. The sensitivity of the charged particle x-ray excitation method using protons is illustrated.

30190 **APTIC NO. 52398**

Kato, Y. and H. Takuma

A NEW SCHEME OF HIGH RESOLUTION AND A HIGHLY EFFICIENT RAMAN SPECTROMETER USING A TUNABLE LASER. *IEEE (Inst. Elec. Electron. Engrs.) J. Quantum Electron, 8(6):580-581, June 1972.*

A new type of Raman spectrometer which has higher resolving power and superior light collecting efficiency over conventional Raman spectrometers is proposed and the results of a preliminary experiment are reported. In this system the wavelength of the exciting radiation is changed, and the scattered light is observed through a filter system of fixed frequency. The Raman spectrum i s obtained by scanning the frequency of the exciting radiation. Raman scattered light is observed through the combination of a premonochromator and a Fabry-Perod interferometer. This spectrometer system is about 50 times higher in light collecting efficiency than a conventional system, when both systems are operated with the same resolving power. This should be very useful for weak light scattering as the air-pollutant detection.

30191 **APTIC NO. 51873**

Kopylov, V. P.

DESIGNING TAPE FEED MECHANISM FOR FRAME TYPE AEROSOL SAMPLERS. *(K raschetu lentopротyazhnogo mekhanizma kadrovogo aerozolnogo zabornika). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):131-136, 1972. 2 refs.*

Formulae for designing a filter tape feed mechanism for indexing aerosol samplers are presented. Such samplers, controlled by a program unit, are equipped with an electric engine which at preset intervals indexes a filter tape extending perpendicularly to the air flow direction between two reels. The motor is shut off, and, consequently, the indexing is terminated by a cam inserted in an index drum after the latter is rotated by the filter tape for a certain angle.

30192 **APTIC NO. 51780**

Lederman, S. and M. H. Bloom

THE RAMAN EFFECT AND AIR POLLUTION MEASUREMENTS. *J. Environ. Syst., 2(4):311-337, Dec. 1972. 11 refs.*

The application of Raman scattering to air pollution detection monitoring and measurement is investigated. Some theoretical, as well as practical, aspects of the problem are discussed. Positive and negative features of the Raman scattering diagnostic techniques are pointed out. The problems associated with the utilization of lasers, the power requirements frequency selection, pulse repetition rate, and reliability are discussed. The diagnostic technique utilizing Raman scattering has sufficient outstanding features to make it particularly suitable for

the task at hand. The experimental Raman spectrophotometer developed is described.

30193 **APTIC NO. 52362**

Leonard, Donald Allan

REMOTE ANALYSIS BY RAMAN SCATTERING OF GASES POLLUTING THE ATMOSPHERE. *(Vorrichtung fuer die Fernanalyse von Gasen). Text in German. (AVCO Corp., Greenwich, Conn.) W. Ger. Pat. Appl. 2,202,969. 28p., Jan. 21, 1972. (15 claims).*

In the equipment for remote analysis by Raman scattering of gases, a masking of the Raman scattered beam by a reflected intense laser beam is avoided by the use of a filter for the beam in the path between the target and the detection device. The improved equipment also provides a device for the determination of distance to the gases.

30194 **APTIC NO. 52384**

Maguire, B. A. and D. Barker

MASS CONCENTRATIONS OF RESPIRABLE DUST DURING MINING IN FAULTED STRATA. *Mining Eng. (London), 131(139):359-363, April 1972. 5 refs.*

Samples of respirable dust were taken over a prolonged period of time on a face which was passing through a fault. The mass concentrations of respirable airborne dust were measured at the routine sampling point in the return with the MRE sampler, and experienced by men working on or near the face were measured by wearing the SIMPEDS gravimetric personnel sampler. The results are presented in terms of the ratio of the SIMPEDS measurements to those obtained with the MRE sampler. The ash and quartz contents of the samples were in the approximately range 35-75% and 5-28%, respectively. (Author abstract modified)

30195 **APTIC NO. 52232**

Maugh, Thomas H., III

AIR POLLUTION INSTRUMENTATION: A TREND TOWARD PHYSICAL METHODS. *Science, 177(4050):685-687, Aug. 25, 1972.*

Wet chemical instruments for measuring pollutant concentrations in the immediate vicinity of the instrument yield highly reproducible results and are sensitive, simple to operate, and inexpensive. These advantages are largely offset by many drawbacks, including interference by other pollutants, instability of reagents, the large amount of time required for sampling and quantifications, and in some cases low efficiency (e.g., for nitrogen dioxide). Many environmental scientists are switching to instruments based on physical methods such as chemiluminescence, electrochemical transducers, and flame ionization coupled with gas chromatography. Chemiluminescence is now the standard reference method for measuring ozone concentration; gas chromatography is used for monitoring sulfur containing pollutants and hydrocarbons. Without further refinements, electrochemical transducers may remain a stopgap technique. Other techniques for monitoring pollutants include automated gas chromatography, non-dispersive infrared spectroscopy, dispersive spectrophotometers, and microwave spectrometers. Miniature electrochemical cells constructed with a solid electrolyte are under investigation. They show great increase in reliability, simplicity, and longevity compared to current instruments of all types.

30196 **APTIC NO. 51934**

Nikoforova, N. K.

DISTORTION IN THE AEROSOL PARTICLE SIZE DISTRIBUTION DUE TO THE STIMULTANEOUS PRESENCE OF TWO PARTICLES WITHIN THE COUNTER SPACE OF PHOTOELECTRIC INSTRUMENTS. *(Iskazheniye raspredeleniya chastits aerozolya po razmeram za schet odnovremennogo popadaniya dvykh chastits v chetnyy obem fotoelektricheskogo apparata). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):88-98, 1972. 9 refs.*

Method for the calculation of the distortion produced in the aerosol particle size distribution by the simultaneous presence within the counter space of photoelectric particle counters of two aerosol particles is presented. The calculation takes the shape of the counter pulse, an important factor regarding the magnitude of the distortion, as well as the shift of the summation pulse peak into account. The methods ignoring the shape of the counter pulse, and the shift of its peak are less suitable for the evaluation of the magnitude of the distortion. The distortion obtained for a bell-shaped counter pulse, which occurs commonly, is smaller than that obtained under the assumption of a reactangular counter pulse.

30197 **APTIC NO. 51841**

Okita, Toshiichi and Maki Inugami

CALIBRATION AND OTHER TESTS OF A CHEMILUMINESCENT NO RECORDER. *(Kagaku hakkoho o mochiita NO jido kirokukei no kentei). Text in Japanese. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 21(1):37-39, March 1972. 3 refs.*

A chemiluminescent nitric oxide recorder was calibrated using cylinder NO diluted by purified nitrogen. A linear response was observed for NO concentrations between 0 and 1 ppm. Comparative NO measurements were made using chemiluminescent and Saltzman recorders. A good correlation was obtained between readings of the recorders, the relation between measured concentrations being Y equals 0.016 + 1.18 X where X is the NO concentration measured by the chemiluminiscent recorder and Y the concentration measured by the Saltzman recorder. (Author abstract modified)

30198 **APTIC NO. 52480**

Pena, J., R. de Pena, and R. Lavoie

A CONTINUOUS CLOUD SAMPLER. *J. Rech. Atmospheriques, 6(1-3):409-417, Jan.-Sept. 1972. 2 refs.*

An airborne cloud sampler based on droplet replication on a gelatin covered film running over a cylindrical collector is described, and some results obtained with this instrument in maritime tropical cumuli are presented. The main limitation of this sampler comes from the fact that while sampling in-cloud regions with high liuqid water content (LWC), the gelatin appears to be washed out. In measurements with film exposure time of 0.05 sec, the cutoff liquid water content was 0.5 g/cu m. Subsequent reduction of exposure time to 0.011 sec increased the cutoff to a liquid water content of 1.3 g/cu m. The gelatin continuous sampler proved to ba a reliable instrument to study fogs and clouds. It was used to measure droplet sizes at varying altitudes. It is mechanically simple, remotely controlled, and has sufficient capacity for continuous sampling over path lengths exceeding 14 km. By operating at lower speeds the sampler can also be used as an aerosol sampler for particles larger than 1 micron in radius. Specific chemical reagents can be added to the gelatin to facilitate special aerosol analysis. (Author abstract)

30199 **APTIC NO. 51983**

Rhodes, J. R., A. H. Pradzynski, and R. D. Sieberg

ENERGY-DISPERSIVE X-RAY EMISSION SPECTROMETRY FOR MULTI-ELEMENT ANALYSIS OF AIR PARTICULATES. *ISA (Instr. Soc. Am.) Trans., 11(4):337-345, April 1972. 16 refs. Atomic Energy Commission Contract AT-(40-1)-4205. (Presented at the Analysis Instrumentation Symposium, 18th, San Francisco, Calif., May 3-5, 1972.)*

X-ray fluorescence analysis using radioisotope sources for excitation, a silicon (lithium) detector for energy-dispersive spectrometry, and a minicomputer for data reduction and automatic instrument control, has been used to determine the heavy element constituents of air particulates collected on filter paper. In a state-wide survey, 89 samples were collected at a number of Texas stations: 17 elements per sample were determined. For comparison, parallel measurements using atomic absorption spectrophotometry were made on 12 of the samples. Since satisfactory sensitivity for all elements measured by X-ray fluorescence was obtained by direct analysis of the filter paper, sample preparation and wet chemistry were avoided. This, coupled with the multi-element, non-destructive nature of the technique, reduced the cost and time of analysis significantly. As a result, more extensive and revealing air particulate surveys should be possible, with consequent improvements in the discovery and positive identification of particulate pollution sources. (Author abstract)

30200 **APTIC NO. 52382**

Schlossberg, Howard R. and Paul L. Kelley

USING TUNABLE LASERS. *Phys. Today, 25(7):36-42, 44, July 1972. 28 refs.*

The operating principles and properties of several tunable laser sources are reviewed. In dye lasers, the very broad bandwidth is narrowed, and thus made tunable, through the use of highly frequency-selective optical resonators. Lasers made from-dyes such as oxazole, xanthene, and anthracene feature an output from 1.2 to 0.34 micron in the pulsed mode and linewidths as narrow as 35 MHz. Fine tuning of recombination-radiation semiconductor lasers is accomplished by pressure, temperature, and magnetic field variations of the index of refraction, and thus the cavity-mode frequency. The spin-flip Raman laser uses a fixed-frequency laser to pump a semiconductor crystal in a magnetic field. Other nonlinear optical device concepts include optical mixing and optical parametric oscillation. These rely on the properties of a nonlinear crystal. All the tunable lasers have narrow bandwidths, spatial coherence of the tunable output, and high power per unit spectral interval. Some applications of rapid high-resolution laser absorption spectroscopy include air pollution monitoring and automobile-exhaust analysis.

30201 **APTIC NO. 52221**

Vasak, V.

GALVANIC CELL FOR MONITORING CHLORINE IN AIR. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 293-298. 3 refs. (May 15-18.)*

Chlorine concentrations in the working atmosphere and in residual gases emitted to the atmosphere can be determined by measuring the electric current generated in a galvanic cell. Platinum and silver electrodes in the form of fine gauzes are wound around a wetted wick of filter paper, emerging from a stagnant electrolyte pool. Potassium bromide in a buffered solution is the preferred electrolyte. The half-wet arrangement of the cell enables a fast movement of the gas to the electrode and greatly increases the sensitivity of the equipment. The slight response of the cell to atmospheric oxygen is electrically suppressed. Construction of the galvanic cell from standard parts, electrical circuit, optimal operating conditions, and possible interferences are described in detail. The cell is calibrated with an electrolytic chlorine generator run under noncoulometric conditions. Important industrial applications of the sensing cell are monitoring leaks or accidental chlorine evolution and as an indicator of exhaustion of scrubbing solution and breakthrough of tail gases containing chlorine. (Author abstract modified)

30202 **APTIC NO. 52076**

Whitley, J. E.

NUCLEAR TECHNIQUES FOR ENVIRONMENTAL STUDIES. *Trans. Soc. Occup. Med., 22(4):126-129, Oct. 1972. 8 refs. (Presented at Scottish Group Meeting, Jan. 19, 1972.)*

Analytical techniques using isotopic measurements have unique advantages when applied to environmental studies. Traces of organic compounds can be determined using compounds labeled with radioactive carbon or hydrogen, and isotope dilution analysis or isotope derivative analysis. Using a mass spectrometer, changes in the isotopic ratios of carbon, oxygen, or sulfur can be detected, and the source of a particular pollutant can thus be determined. Neutron activation analysis is renowned for its high sensitivity; the activities of the desired elements of the mixture of isotopes produced by irradiation can be determined by radiochemical separation or nondestructive gamma ray spectrometric analysis.

30203 **APTIC NO. 52438**

Yamanaka, Chiyoe, Sadao Nakai, Yasuaki Nagao, Ichiro Sabe, Toshiaki Kashihara, Akio Chikada, Shotaro Nishimura, Kizuna Suzuki, Yoshishige Murakami, Shinzo Kitamura, Soichi Haji, and Jun Kobayashi

PRESENT STATE OF AN ATMOSPHERIC OBSERVATION LASER RADAR SYSTEM IN OSAKA UNIVERSITY. *(Osaka daigaku ni okeru taikikansokuyo reza reda shisutemu no genjo). Text in Japanese. Seisan to Gijutsu (Prod. Tech.), 24(11):1-16, Dec. 1972. 8 refs.*

Lidar systems including Raman backscattering, resonance backscattering, elastic scattering, and resonance absorption can detect atmospheric air pollution. Various lidar systems using wavelengths ranging from electromagnetic to infrared have been installed in Osaka University. Ruby lasers, glass lasers, semiconductor lasers, and other types of laserss are used in the laser radar (lidar) systems. Visible laser rays are used to measure molecules and dust particles and electromagnetic wave radar operated in the range of longer wavelength is used to analyze raindrops, thick fog, and smog. Data obtained by the lidar is analyzed by a computer data processing system.

30204 **APTIC NO. 51933**

Yudin, K. B.

PROBLEMS OF THE BIDIMENSIONAL ANALYSIS OF ATMOSPHERIC AEROSOL PARTICLE DISTRIBUTION. *(Voprosy dvukhmernogo analiza raspredeleniya chastits atmosfernogo aerozolya). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):104-116, 1972. 6 refs.*

Problems of the bidimensional analysis of atmospheric aerosol particle distributions are discussed with regard to cloud aerosols. The output signal from photoelectric transformers constitutes a series with random distribution in time of electric pulses with random amplitude, which can be described by a bidimensional integral law of distribution. For practical computational purposes, however, the distribution of the system of random magnitudes is characterized by bidimensional density of the distribution rather than by distribution function. The bidimensional analysis of particle size and interval distributions is possible by means of amplitude-time analyzers, computing mean, quadratic, and mean cubic sizes of particles. Formulae for the determination of the necessary number of analyzer channels for uniform and logarithmic spacing of particle size intervals are given.

1971

30205 **APTIC NO. 52239**

Bott, Barry, Jack Graham Firth, Alan Jones, and Thomas Alwyn Jones

GAS DETECTOR. *(Gaserfassungsgeraet). Text in German. (National Research Development Corp., London (Great Britain)) W. Ger. Pat. Appl. 2,142,796. 23p., Aug. 26, 1971. (21 claims).*

A highly sensitive apparatus for detecting a gas in the presence of other gases is based on the redox reaction of the gas with a semiconducting metal oxide device which is alloyed with one or more metals. Thus, methane can be detected with zinc oxide containing 3% or less platinum and 3% or less gallium. Basic gases, such as ammonia, can be detected either with ferric oxide containing 3% or less thallium or cerium or with silver oxide containing 3% or less gallium. Reducing gases, such as hydrocarbons or carbon monoxide, can be detected with nickel oxide containing 3% or less gallium. The gases are detected by measuring the change in the electrical conductivity of the semiconductor caused by the redox reaction with the gas; the change in conductivity is monitored by two electrodes placed in the semiconductor.

30206 **APTIC NO. 53365**

Parker, D. R. and L. W. Brewer

TECHNIQUES FOR REMOTE SAMPLING OF GASES. *Am. Ind. Hyg. Assoc. J., 32(7):475-479, July 1971. 5 refs.*

The methods and materials used to obtain gaseous samples from distant points within the tunnel system and the methods used to analyze the samples on arrival at the laboratory are discussed. The methods used are to place instrumentation at the remote site and telemeter the results of the analysis by electrical signal to the central control point, and to collect the sample with remotely operated valves and transport the sample to a central laboratory for analysis. The letter method is selected as the most practical approach for sampling the gaseous environment inside the tunnels where underground nuclear tests had been conducted. By using as much as 6500 feet of small-diameter tubing and a specially adapted gas chromatograph, meaningful data have been obtained without exposing personnel to the inherent dangers of the tunnel. The long-line system calibration is described. (Author abstract modified)

30207 **APTIC NO. 52371**

Roper, C. Paul

AN EVALUATION OF PERCHLOROETHYLENE DETECTOR TUBES. *Am. Ind. Hyg. Assoc. J., 32(12):847-849, Dec. 1971. 3 refs.*

Perchloroethylene detector tubes marketed in the U. S. and intended for the concentration range of one-half to four times the threshold limit value were evaluated for acceptable performance, i.e., plus or minus 25% accurate at the 95% confidence limit. At each of four test concentrations, reading were obtained for 10 tubes from each type. The average of three independent reading was used as the test reading for each individual tube. The three tube types that met the evaluation criteria for acceptable performance are listed.

30208 **APTIC NO. 52399**

Spurny, K. and G. Madelaine

ANALYTICAL METHODS FOR DETERMINATION OF AEROSOLS BY MEANS OF MEMBRANE ULTRAFILTERS. XIX. EFFICIENCY MEASUREMENT OF NUCLEAR PORE FILTERS BY MEANS OF LATEX AEROSOLS. *Collection Czech. Chem. Commun. (Prague), 36(8):2857-2866, Aug. 1971. 11 refs.*

The filtration properties of Nuclear Pore Filters were studied by using them for latex aerosol filtration. The filtration efficiency, the selectivity and the filtration kinetics of these filters were measured by means of model latex aerosols in the range of particle sizes 0.3 through 1.1 micron and by means of a particle counter Royco. The former filtration equation of a pore filter was modified according to the experimental results. The selectivity of these filters was excellent, and the clogging for larger particle sizes very slow. (Author abstract)

30209 **APTIC NO. 52379**

Warren, Gary J. and Gordon L. Babcock

MONITORING A CHEMILUMINESCENCE REACTION BETWEEN TWO GASES. *(Einrichtung zuer Ueberwachung einer Chemolumineszenzreaktion zwischen zwei Gasen). Text in German. (REM Inc., Santa Monica, Calif.) W. Ger. Pat. Appl. 2,203,400. 12p., Jan. 25, 1971. (12 claims).*

The chemiluminescent reaction in a flow system of ethylene and ozone (or ozone in the presence of nitrogen dioxide, sulfur dioxide, or chloride) can be monitored by a system comprising a photomultiplier receiver, an amplifier, an analog, a digital converter, and a readout. The reaction cell is equipped with a wall permeable for the chemiluminescence radiation. In the interior of the cell within a small distance to this wall is the mixing chamber for the gases. The mixing chamber is open toward the wall. Two gas supply pipes, one inside the other, lead to the mixing chamber. At ozone concentrations characteristic for ambient air and at an air flow rate of 1 l/min, the ethylene flow may amount to 5-20 ml/min -- preferably 10 ml/min. The reaction cell has a volume of about 100 ml. The monitor is designed for continuous operation at atmospheric pressure. Concentrations between O and 200 ppm can be measured. The accuracy is plus or minus 1%.

1970

30210 **APTIC NO. 52261**

Arentsen, Aart

TREATMENT PREPARATORY TO ANALYSIS OF EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES. *(Aufbereitungsvorrichtung fuer die Abgase von Verbrennungsmotoren zur Abgasanalyse). Text in German. (Philipp Gather, K.-G., Mettmann (West Germany)) W. Ger. Pat. Appl. 2,060,710. 14p., Dec. 10, 1970. (4 claims).*

The apparatus for washing motor exhaust gases prior to analysis consists of two concentric cylinders with a common base near to which the cylinders are connected by an aperture in the base of the inner cylinder. The shorter outer cylinder has a cover fitted around the inner cylinder below which is inserted the exhaust gas inlet pipe which passes into the inner cylinder. The closed end of the pipe is centrally located and has a gas outlet on the underside directing the flow of exhaust gas downwards. The outer cylinder has a water outlet below the level of the gas inlet pipe. The cover of the taller inner cylinder carries a standard centrally positioned water nozzle screwed into the cover and directing a hollow conical spray of water over the incoming downward-directed gas stream which impinges on the surface of the residual water in the inner cylinder before flowing upwards through the spray to pass through a series of baffles in the cover into the gas outlet positioned eccentrically in the inner cylinder cover. The washed exhaust gases are free from water soluble and solid impurities and are brought to room temperature and moisture content.

30211 **APTIC NO. 52370**

Hofmann, Kurt

OBTAINING A FLAME IONIZATION DETECTOR ION STREAM INDEPENDENT OF THE OXYGEN IMPURITIES OF THE TEST GASES. *(Verfahren zur Erzielung eines von Sauerstoffbeimengungen des Probengases unabhaengigen Ionenstromes eines Flammenionisationsdetektors). Text in German. (Hartmann und Braun A. G, Frankfurt (West Germany)) W. Ger. Pat. Appl. 2,039,092. 12p., Aug. 6, 1970. (6 claims).*

The design of a capillary tube modified to obtain an ion stream independent of the oxygen impurities of the test gases used in the flame ionization detection of hydrocarbons in the exhaust gases of internal combustion engines was studied. The burner was additionally charged with a constant stream of the air or air-mixture supplied through the capillary tube within the base section of the detector. The oxygen amounted to only 5% of the combined total of combustion gas, gas sample, and additional gas flow.

30212 **APTIC NO. 52269**

Taguchi, Naoyoshi

GAS-DETECTING SEMICONDUCTOR DEVICE. *(Gasspuergeraet). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,065,023. 6p., April 6, 1970. (2 claims).*

The reliability of a metal oxide semiconductor gas detector was improved by automatic heat control. A constant temperature was maintained even with a change in ambient air. The rod-shaped semiconductor is thermally coupled to a heating rod, preferably of the same material. The heating rod is connected to a permanent resistance. A voltage source is provided, and if the resistance of the heating rod changes, it delivers the required heat to maintain the detector rod at a constant temperature.

1969

30213 **APTIC NO. 51919**

Schroeder, Thomas Dean

THE APPLICATION OF X-RAY EMISSION SPECTROMETRY AND SQUARE-WAVE POLAROGRAPHY TO THE DETERMINATION OF TRACE LEAD AS AN AIR AND WATER POLLUTANT. *Iowa Univ., Iowa City, Dept. of Analytical Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1969, 129p. 74 refs.*

The application of X-ray spectrometry and square-wave polarography in determining trace lead as an air and water pollutant was investigated. X-ray spectrometry was considered appropriate to analyze samples of particulate matter collected from the air, while square-wave polarography was used to analyze water samples. The experimental approach and procedures are described. Single channel instrumentation was compared to two channel instrumentation for its efficiency. Various operating conditions, including pulse height discrimination, scintillation voltage, pulse amplifier gain, first dynode potential, x-ray tube voltage, back-ground intensity, and frequency effects were reviewed.

AIR QUALITY MEASUREMENTS

1973

30214 **APTIC NO. 51759**

Japan Environment Agency, Burea of Air Quality

REPORT OF THE RESULTS OF MEASUREMENT OF AUTOMOBILE EXHAUST. *(Jidosha haishutsu gasu sokutei hokokusho). Text in Japanese. 162p., March 1973.*

The results of measurements in 1971 of automobile exhaust from each area in Japan are compiled, covering carbon monoxide, hydrocarbons, nitrogen oxides, floating dust, sulfur oxides, and oxidants. The stations for measuring automobile exhaust all over the country number 116 for carbon monoxide, 14 for hydrocarbons, 33 nitrogen oxides, two for floating dust, six for sulfur oxides, and 12 for oxidants. At the present time, local public bodies are consolidating the stations, and the number of stations is being increased; but it is too short a time to fully grasp the situation of air pollution due to automobiles. The measured data, which are a basis for watching for the transition of air pollution due to automobiles in the future, are compiled, regardless of the time of measurement.

30215 **APTIC NO. 51885**

Japan Environmental Agency, Bureau of Atmospheric Safety

THE NATIONAL AIR POLLUTION MONITORING NETWORK, 1971 MEASUREMENTS. *(Showa 46-nendo kokusetsu taiki osen sobuteimo sokutei kekka). Text in Japanese. 247p., Feb. 1973.*

Air pollution data obtained from 13 monitoring centers throughout Japan in 1971 are given. The data from 1968 to 1970 are also listed for comparison. In large cities and industrial areas such as Tokyo, Osaka, and Kawasaki, the sulfur dioxide and airborne particulate concentrations were reduced remarkably from 1968 to 1971. The average sulfur oxide concentration in 1968 in Tokyo was 0.054 ppm, whereas that in 1971 was 0.015 ppm. The SOx concentration at Kawasaki was reduced from 0.084 ppm in 1968 to 0.062 ppm in 1971. The nitrogen oxides concentrations showed no improvement, particularly in large cities where increases rather than decreases of the concentrations were observed. Dust composition including cadmium, lead, zinc, vanadium, manganese, iron, cobalt, nickel, and copper was measured.

30216 **APTIC NO. 52139**

Kobe Municipal Office (Japan), Social Welfare Dept.

KOBE CITY AIR POLLUTION SURVEY/RESEARCH REPORT, NO. 14 (1971). *(Kobe-shi Taiki osen chosa kenkyu hokoku, Dai 14-po (Showa 46-nen)). Text in Japanese. 144p., Feb. 1973.*

Data is given on emission sources of smoke, measuring points, precipitating dust, suspended particulates, sulfur oxides, oxidants, inversions, and dissemination of air pollution information for the Kobe city area in 1971. One thousand stationary emission sources consumed 688,000 tons of heavy oil during the year. About 7,658,000 N/cu n/yr of SOx was emitted by these sources. In March the highest SOx concentration was recorded (699,000 N/cu m); in August the lowest was recorded (577,000 N/cu m). Nine stations monitor air pollution, four monitor precipitating dust, and 28 monitor SOx. Dust fall equaled 7.54 tons/sq km/mo yearly average at one of the four measuring points and 13.97 at another; in 1970 these figures were 11.05 and 20.71. One-hour suspended particulate concentration was 0.063 mg/sq m at one station and 0.038 at another, a decrease from the previous year. At a third station, suspended dust was 0.075 mg/sq m, an increase over the previous year. Sulfur dioxode concentrations were reviewed in relation to wind direction and velocity. Carbon monoxide and dioxide were measured throughout the year; oxidant was measured from June.

30217 **APTIC NO. 51741**

Bergamini, P. G., G. Palmas, F. Piantelli, and M. Rigato

ANALYSIS OF PARTICLE SIZE AND RADIOACTIVITY OF ATMOSPHERIC DUST. *Health Phys., 24(6):655-663, 1973. 11 refs.*

In Siena, Italy, over a period of 3 years, atmospheric dust was collected by means of impaction and electrostatic precipitation. The radioactivity of the dust collected was analyzed, as well as the particle size distribution. The relationship of particle sizes and associated radioactivity are given, and the effect of humidity is discussed. (Author abstract)

30218 **APTIC NO. 51760**

Collins-Williams, C., H. K. Kuo, D. N. Garey, S. Davidson, D. Collins-Williams, M. Fitch, and J. B. Fischer

ATMOSPHERIC MOLD COUNTS IN TORONTO, CANADA, 1971. *Ann. Allergy, 31(2):69-71, Feb. 1973. 5 refs.*

Atmospheric mold counts were determined daily in metropolitan Toronto from January to December 1971. The sampling and analysis techniques are reviewed. Peak mold season was from the first week of June to the first week of November, and mold growth peaked at the same time with an additional peak from January 1 to late March. The important molds in order of numbers were Hormodendrum, Alternaria, smut, and yeast.

30219 **APTIC NO. 52216**

Deuber, Arnold and Martin Waibel

EXPERIENCES FROM FIVE YEARS OF DUST FALL MEASUREMENTS IN ZURICH - PART II. *(Erfahrungen aus fuenf Jahren Staubniederschlagsmessung in Zurich - II). Text in German. Staub, Reinhaltung Luft, 33(6):238-241, June 1973. 6 refs.*

Dust fall, measured on roofs in Zurich, Switzerland, averaged 2.7 g/sq m/mo from 1966 to 1970 compared with 1.9 g/sq m/mo for the rest of the country. Corresponding pH values averaged 3.1 and 3.5, respectively. Significant correlations could be found between dust fall values and demographic structure. Correlations between dust fall variations in time and meteorological data were examined by factor analysis. A clear correlation between dust fall and emissions was found while pH values and polynuclear aromatic hydrocarbons correlated with meteorological data.

30220 **APTIC NO. 52169**

Fara, G. M., A. Pagano, and G. Ziglio

AIR POLLUTION DUE TO TRAFFIC IN DOWNTOWN MILAN. *(Indagini sull inquinamento da traffico motorizzato nella citta di Milano. Text in Italian. Minerva Med., 64(6):254-271, Jan. 27, 1973. 27 refs.*

Carbon monoxide determinations were made simultaneously every 5-10 min in a number of central areas and a road tunnel in Milan during the period winter 1969 to spring 1970. Meteorological and traffic conditions were also recorded. Six samplings in one area (Via Mercanti) revealed a highly significant (p less than 0.01) traffic-CO ratio. In all areas, a contaminated zone close to the source of pollution could be distinguished; this was marked by points with CO concentrations different with respect to their position and related to the prevailing meteorological and traffic conditions. Comparison with results obtained in 1955-1958 showed marked deterioration in the situation. This is attributed to the massive increase in traffic that has occurred over the last 10 years.

30221 **APTIC NO. 52521**

Glogg, Peter

RESULTS OF SULFUR DIOXIDE MEASUREMENTS IN THE ZURICH AIR. *(Ergebnisse von Schwefeldioxid-Bestimmungen in der Zuercher Stadtluft). Text in German. Gesundheitstech., 7(5):88-92, 1973.*

The results of sulfur dioxide measurements taken since Sept. 30, 1971 in Zurich are given. The samples were taken in a height of 445 m above sea level, about 40 m above the ground level. A Picoflux conductivity measuring unit with an integrator was used. The maximum half-hourly average in winter was 0.39 ppm, the maximum diurnal average was 0.25 ppm; in summer the maximum half-hourly average was 0.26 ppm, the maximum diurnal average 0.12 ppm. The standards were never exceeded. A comparison with standards in the U. S. and in the Federal Republic of Germany shows that the concentrations were at times above these limit values. A comparison with the SO2 concentrations in Munich measured at an earlier period reveals that this city has lower SO2 pollution than Zurich. In Zurich the monthly average concentration in Jan. 1971 was nine times larger than in Aug. 1971. For instance on Jan. 1, 1971 the diurnal average was 6.9 pphm, on Jan. 9 and 12 the maximum diurnal averages were 23.7 and 23.6 pphm. On Aug. 1, 1971 the diurnal average was 0.7 pphm, the maximum diurnal average was 2.4 pphm. It was measured on the last day of August.

30222 **APTIC NO. 51878**

Harries, J. E.

MEASUREMENT OF SOME HYDROGEN-OXYGEN-NITROGEN COMPOUNDS IN THE STRATOSPHERE FROM CONCORDE 002. *Nature (London), 241(5391):515- 518, Feb. 23, 1973. 30 refs.*

Measurements of the sub-millimeter wavelength far infrared emission spectrum of the stratosphere were made from Concorde 002 during its tour of the Far East in June 1972. The spectra recorded with a Michelson interferometer were analyzed to provide concentration and mixing ratio data for the species water, ozone, nitric acid, nitrous oxide, and nitrogen dioxide. Individual and global average values of volume mixing ratios are given. The mean values are 3 times 10 to the -9th power from HNO3, 3 times 10 to the -6th power for H2O, 4.9 times 10 to the -6th power for O3, 20 times 10 to the -9th power for NO2, 210 time 10 the -9th power for N2O measured at 3 km above the tropopause, and 270 times 10 to the -9th for N2O measured at the tropopause. These values are compared with calculations by other workers.

30223 **APTIC NO. 52334**

Kimura, Toshihiro and Harumi Yamamoto

MEASUREMENT OF THE AIR OF MATSUE CITY. *(Matsue-shi ni okeru takki sokutei kekka ni tsuite). Text in Japanese. Shimane-ken Eisei Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Pub. Health Inst.), no. 13:40-42, March 1973.*

Sulfur oxides, nitrogen dioxide, nitric oxide, floating dust, wind, temperature, and humidity were measured in Matsue city in 1970. The SOx, floating dust, and nitrogen dioxide was measured by conductometry, light scattering, and the Saltzman methods, respectively. The SOx concentration was highest in the winter (a maximum of 26.6 ppb in February) and lowest in the summer (minimum of 6.9 ppb in August). Thus, the environmental standard was met. The NOx concentration was lowest in the summer (1.0 ppb NO2 in July and 0.5 ppb NO in August and September) and highest in the winter (13.5 ppb NO and 11.5 ppb NO2 in December). Daily variations were noted.

30224 **APTIC NO. 51963**

Koehler, Albert

INTERNAL AND EXTERNAL AIR CONTAMINATION. *(Luftverunreinigung innen und aussen). Text in German. Deutsche Forschungsgemeinschaft, Mainheim (West Germany), Kommission Luftverunreinigende Stoffe, Part 4.3, 2p., April 1973, 15 refs.*

Sulfur dioxide concentrations were measured inside an office building, dioxide was also measured in the busy main street area outside. On the fifth floor of an office building an SO2 analyzer operating according to the conductivity principle was set up. Internal and external air samples were passed alternately in intervals of 15 min to the analyzer. The diurnal indoor variation was much less pronounced than outdoors. Also, the indoor concentrations fluctuated very little with the seasons. Indoor rooms seem to have the capacity of maintaining the SO2 concentration on a uniform level. The reason for this may be found in the building material containing calcium compounds which bind the SO2. For confirmation of this assumption, SO2 concentrations of more than 5 mg SO2/cu m were produced in a test chamber with closed windows. Within 4-5 hours the normal concentration was reached again. A second experiment during which the windows were left open for a period of 1.5 hr with high outdoor SO2 concentration brought similar results. Upon reaching the same SO2 indoor concentration as had been measured outdoors, the windows were closed. The SO2 level indoors dropped exponentially to the normal concentration.

30225 **APTIC NO. 52151**

Kumazawa, Yasumasa

THE PRESENT AND FUTURE OF AIR POLLUTION IN LARGE CITIES AND THEIR VICINITIES (3)--THE KOBE-OSAKA AREA. *(Daitoshi to sono shuhen chiiki ni okeru taiki osen no genjo to shorai (3)--Hanshin chiku). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(3):11-20, March 1973.*

The transitions of fuel consumption and the sulfur content in fuel oil, pollutant measurements over the years, and the increase of cars and traffic in the Osaka area are discussed. The measurements of sulfur dioxide, suspended particulates, carbon monoxide, nitrogen oxides, and oxidants for 1971 are presented. Both emission quantity and environmental concentration of SO2 show a decreasing trend. There seems to be a hope for the future as long as the construction of new, large emission sources is not scheduled. The government must hurry the determination of nitrogen oxide environmental standards and emission standards. Oxidant was measured by the neutral potassium iodide colorimetry method at 17 locations in Osaka. The maximum 1-hour measurement was 0.27 ppm, and the 1-hour measurement reached 0.15 ppm at 11 locations. Hydrocarbons were measured at 12 locations in 1971. The year s average HC concentration was 0.85-2.1 ppm, and the maximum hourly measurement was 8.0 ppm. The highest average for settling particles in 1971 was 0.161 mg/cu m. But there was a general tendency for a decrease of settling particles everywhere.

30226 **APTIC NO. 52302**

Lavillaureix and Blanc

AIR POLLUTION STUDY IN THE STRASBOURG AGGLOMERATION AREA. *(Etude de la pollution atmospherique dans l agglomeration Strasbourgeoise). Text in French. Pollut. Atmos. (Paris), 15(57):48-58, Jan.-March 1973.*

The acid pollutant, especially sulfur dioxide, and particulate matter concentration in the air of the Strasbourg, France, agglomeration area was measured at 11 sampling stations in the Sept. 1, 1971 to Aug. 31, 1972 period. The acid pollutant and smoke concentrations in the October-April winter period were 111 and 99 micrograms/cu m, respectively. The corresponding figures for the summer period were 54 and 41 micrograms/cu m. The SO2 peak concentrations, measured in Nov., Dec., and Feb., ranged from 567 to 636 micrograms/cu m. Whereas the contribution by industrial emissions to the pollutant concentrations was noticeable, the pollutant concentrations were in fairly close correlation with the intensity of heating, i.e., fuel consumption. The weekly concentration distribution showed reduced pollution levels on Saturdays and Sundays due to decreased rate of industrial emissions and reduced traffic density on those days.

30227 **APTIC NO. 51939**

Lovelock, J. E., R. J. Maggs, and R. J. Wade

HALOGENATED HYDROCARBONS IN AND OVER THE ATLANTIC. *Nature (London), 241(5386):194-196, Jan. 19, 1973. 6 refs.*

The distribution of trichlorofluoromethane (CCl3F) in and over the North and South Atlantic Ocean (1971-1972) was determined with an electron capture gas chromatograph that also gave simultaneous measurements of methyl iodide (CH3I) and carbon tetrachloride (CCl4). The three compounds were uniformly distributed both in air and sea, but the concentrations were less than parts per 10 to the 10th power by volume. The observed global distribution of CCl3F was in close agreement with the predicted distribution. The wholly anthropogenic origin of CCl3F and its stability in air make it an ideal reference substance against which to compare man s other emissions to the environment. Methyl iodide is probably a singular product of marine biology and may be a key compound in the natural cycle of iodine between sea and land. In spite of its low aerial concentration, the atmospheric throughput is tens of megatons per year. Carbon tetrachloride is likely a product of natural inorganic chemistry, possibly the reaction of methane in the troposphere with chlorine in a complex sequence of reactions. This substance also is passed through the environment in quantities exceeding 1 megaton annually.

30228 **APTIC NO. 51992**

Megaw, W. J. and H. Flyger

MEASUREMENT OF THE BACKGROUND ATMOSPHERIC AEROSOL. *Aerosol Sci., 4(3):179-181, March 1973. 6 refs.*

The importance of determining the concentration, size distribution, and nature of the atmospheric aerosol and of measuring the changes of these properties with time has been realized in the last 10 years. The determination of the global background aerosol trend is necessary because of the influence of aerosols in inducing climatological changes, both because of the capacity of the larger particles for initiating the condensation of water and of the properties of the total aerosol population in radiation scattering. It appears that the atmosphere over Greenland is a unique and almost ideal location in which to investigate long-term trends in the background level of the global tropospheric aerosol. Several studies of the deposition and ambient concentration of aerosols above Greenland are reviewed.

30229 **APTIC NO. 51993**

Murray, A. J. and J. P. Riley

OCCURRENCE OF SOME CHLORINATED ALIPHATIC HYDROCARBONS IN THE ENVIRONMENT. *Nature (London), 242(5392):37-38, March 2, 1973. 5 refs.*

A project was initiated to examine the environmental distribution of the aliphatic chlorinated hydrocarbons. Some preliminary data for air and natural water are presented. The methods used for the analysis of air and water samples are briefly described. Air sampling was carried out in both rural areas of Britain and over the northeast Atlantic along a line between Cap Blanc and Lands End. The concentrations of these compounds varied significantly from one station to another. No attemp was made to interpret the distribution pattern because of the small number of samples available. In general, the concentration ranges of these compounds in the air over the sea are quite similar to those over the land away from urban areas. Air from towns and cities is considerably enriched with these chlorinated hydrocarbons. The air sampled in the precinct of Liverpool University, contained 18 ng/cu m of chloroform, 2.3 ng/cu m of carbon tetrachloride, 850 ng/cu m of trichloroethylene, and 68 ng/cu m of tetrachloroethylene. The chromatograms from some air samples contained, in addition to the peaks associated with these compounds, peaks arising from dichlorodifluoromethane, trichlorofluoromethane and 1,1,1-trichloromethane.

30230 **APTIC NO. 52447**

Paseeri, Ralph E.

RESPIRABLE DUST CONTENT IN AMBIENT AIR. *Environ. Sci. Technol., 7(7):623-627, July 1973. 15 refs.*

The respirable dust content in the ambient air at a single near-urban location was determined by using a high volume sampler and a cyclone separator to simulate the filtering action of the upper respiratory tract. The performance curve of the cyclone for unit density spheres closely matched an existing model for the filtering action of the nasal pharynx and tracheo-bronchial regions. The experimentally determined ratio of the respirable dust weight to the total suspended particulate weight followed a normal distribution curve with a linear correlation coefficient of 0.0989 and an arithmetic average ratio of 0.56. Thus, on the average, approximately half of the suspended particulate mass at the sampling location was respirable. (Author abstract modified)

30231 **APTIC NO. 51998**

Paterson, M. P.

VISIBILITY, HUMIDITY AND SMOKE IN SYDNEY. *Atmos. Environ., 7(3):281-290, March 1973.*

Meteorological observations taken at 9 am in May at Observatory Hill, overlooking Sydney Cove, in the three periods 1930-1935, 195111956 and 1963-1970 are analyzed. Smoke concentrations were measured as the coefficient of haze. While the mean relative humidity decreased from one period to the next, the geometric mean visibility increased on Sundays in a manner consistent with the calculated regression of log (visibility) on relative humidity. Weekday visibility increased also, but to an extent less than that which is predicted solely from the relative humidity change. Saturday morning visibility did not increase significantly from one period to the next and became indistinguishable from weekday morning visibility. Saturday and Sunday relative humidity was statistically indistinguishable from weekday relative humidity in all of the data. Data from direct measurement at ground level of particulate air pollution during the third period were moderately correlated with the log (visibility), while being almost uncorrelated with relative humidity. Estimates from the regression and from comparison of Sunday with weekday visibility suggested independently that the presently observed average smoke concentrations on May mornings lead to a visibility reduction to less than one-half of the clean air value. Estimated reductions during the earlier periods, derived from the comparison of Sunday and weekday visibilities, are of the same or slightly smaller order. (Author abstract modified)

30232 **APTIC NO. 51988**

Peirson, D. H., P. A. Cawse, L. Salmon, and R. S. Cambray

TRACE ELEMENTS IN THE ATMOSPHERIC ENVIRONMENT. *Nature (London), 241(5387):252-256, Jan. 26, 1973. 35 refs.*

Trace elements in airborne dust arise from the earth s surface and also descend from sources beyond the atmosphere. The terrestrial aerosols are raised from the surface of land and ocean by winds, by the eruption of volcanoes, and by industrial activities. The exploratory program of environmental analysis was established to determine the levels and immediate fate of atmospheric trace elements at a single location near Lake Windemere (Westmorland). Some thirty elements were determined quantitatively in aerosol samples from Wraymires, either as weekly or monthly concentrations. Nine other elements were qualitatively identified. The highest concentrations were about 1 microgram/kg of air, in the case of chlorine, sodium, and calcium. The total mass of particulates was about 20 micrograms/kg of air. Over the limited period of measurement there was a general increase in the concentrations in the air during the winter compared with the summer. The programm of sampling and analysis has been extended to six other stations in the United Kingdom.

30233 **APTIC NO. 52411**

Pilar, Saul and William F. Graydon

BENZENE AND TOLUENE DISTRIBUTION IN TORONTO ATMOSPHERE. *Environ. Sci. Technol., 7(7):628-631, July 1973. 12 refs.*

Individual hydrocarbon concentrations were determined in samples collected at Toronto urban sites. Over 1000 air samples were analyzed for nonmethane hydrocarbons, specifically benzene and toluene. Concentrations varied by a factor of 40 or more between sampling locations, and the variations of concentrations with time were compared with total hydrocarbon concentration in the same location. Overall average concentrations of benzene and toluene were 13 and 30 ppb, respectively. The overall toluene-benzene ratio was 2.4:1. Distinct patterns related to the automobile traffic were determined based on concentration variations with distance and with time. (Author abstract modified)

30234 **APTIC NO. 52512**

Schaetzle, P.

THE AIR POLLUTION BY AUTOMOBILE EXHAUSTS IN A BORDER VILLAGE. *(Die Luftverunreinigung durch Motorfahrzeugabgase in einem Grenzdorf). Text in German. Gesundheitstech., 7(5):94-97, 1973.*

In the border village Vacallo on the Italian-Swiss border the customs stations are in the center of the village. For determination of the air pollution by automobiles which usually cue up for miles behind the customs office, three measurement stations were set up, two on the sidewalks near the street at distances of 0.6 and 1.7 m from the street and one in front of a window of a nearby home (distance 3.8 m). This station was separated from the street by bushes. At all three stations the carbon monoxide, sulfur dioxide, oxides of nitrogen, hydrocarbons, and dust concentrations were determined. At the first two stations the samples were taken at a height of 1.2 m above the ground, at the third station 1.8 m above the ground. The measurements were taken between Oct. 20 and 25, 1972. On the first day of the measurements sluggish truck traffic cuing up for miles occurred; on the third day passenger cars cued up in long lines. On all other days traffic was fluid. During the hours with waiting-line-traffic, the NOx, HC, and aerosol concentrations swelled. With mostly trucks in the waiting lines, the SO2 concentration increased too; with mostly passenger cars the concentration rose. Between 5 and 9 pm the air pollution reached peak values. For instance on the third day between 5 and 5:30 pm the CO concentration reached on the average 30 ppm, the HC concentration 35 ppm, the SO2 concentration 0.03 mg/cu m, and the NOx concentration 0.18 mg/cu m. At the third measurement station, the measured concentrations were 1/2-1/3 the concentrations measured at stations one and two.

30235 **APTIC NO. 52423**

Strunz, Wolfgang

TECHNOLOGY FOR THE PROTECTION OF THE ENVIRONMENT AND CHEMICAL PRODUCTION. *(Technologie des Umweltschutzes und chemische Produktion). Text in German. Allgem. Prakt. Chem. (Vienna), 24(3/4):65-66, 1973.*

At various busy road intersections in Vienna the benzo(a)pyrene concentration was continuously measured. On Matzleinsdorfer Platz an annual average concentration of 100 ng/cu m was measured, on Margaretenplatz 136 ng/cu m. Considering the fact that the daily breathing volume is 20 cu m, a considerable portion of the Viennese population inhaled more than 1.5 micrograms of benzo(a)pyrene/day, which is the quantity contained in 75 cigarettes. The highest lead concentration measured in Vienna amounted to 12 micrograms/cu m. It was measured at the intersection of Waehringer Strasse/Schwarzspanierstrasse. On the Schotten intersection on Stephans square 8 micrograms/cu m air of lead was measured. At present the lead concentration of the atmosphere in Vienna poses no acute danger, but it doubtlessly calls for action.

1972

30236 **APTIC NO. 51925**

Kumamoto Municipal Government (Japan), Bureau of Public Health

SURVEY REPORT OF PUBLIC NUISANCE IN KUMAMOTO CITY, 6TH REPORT. *(Kumamoto-shi ni okeru kogaichosa hokoku, Dai 6-po). Text in Japanese. 84p., Sept. 1972.*

Settling dust, suspended dust, sulfur oxides, noise, and water pollution in 1971 in Kumamoto city, Japan, were measured. Complaints about public nuisance numbered 178, of which 91 cases concerned noise, 23 smoke, 23 dust, 19 effluents, 17 offensive odors, and 2 each about sewage and vibration. The average precipitating dust was 6.81 tons/sq km/mo, which is the lowest level since 1964 and practically the same level as 1966. The highest dust fall was 7.94 tons/sq km/mo. Higher values were recorded in May, June, and July when there was more rain. The suspended dust 6-month average was 0.06

mg/cu m from Oct. 1971 to March 1972. The value exceeded the standard on 12 days. Higher values were recorded in Nov.-Jan. Sulfur oxide concentrations were measured by the lead dioxide method; the highest monthly average was 0.70 mg/100 cu cm/day. The average of the four measuring stations was 0.50 mg/100 cu cm/day. The 6-month average SOx value for Oct. 1971 to March 1972 measured by the conductometric method was 0.026 ppm. The monthly carbon monoxide average for March-Sept. 1971 was 4.5-6.0 ppm; the highest daily average was 7.0-8.0 ppm; the highest hourly average was 15.5 ppm.

30237 **APTIC NO. 52025**

Ako Municipal Government (Japan)

DATA ON PUBLIC NUISANCE OF AKO CITY (NO. 3). 1972 (FROM APRIL 1971 TO MARCH 1972). *(Ako-shi no kogai shiryo (dai 3-go), Showa 47 nendo ban). Text in Japanese. 166p., Sept. 1972.*

Ako is a small industrial city with the total of 2800 business and manufacturing operators in spinning, fish net, refractory brick, nonferrous metals, synthetic fiber, cement, transmitter, and other industries. The major population and more than 70% of the operators are concentrated in the south of the city. The 17 major factories along the shore consume 218,000 kl of fuel annually. The number of pollution incidents have increased rapidly with the industrialization of the city. The meteorological characteristics that influence air pollution and air pollution conditions are reported. The city is situated in a narrow strip of land surrounded by relatively low (200-400 m) but complex shaped hills on three sides, and the distance from the shore to the hills is 2-4 km and to the top of the hills is 3-5 km. The air current from the dawn to about 10 am continues to be unstable and unpredictable throughout the year; after that the air stabilizes and a complete calm comes toward evening. From these topographic and meteorological characteristics, the atmospheric layers are divided at the altitude of 200 m, and the upper and lower parts have considerably different patterns. In the lower layer, the air dispersion conditions are extremely poor and local smogs form easily. Settling particles are measured at six locations, suspended particulates at one location, sulfur oxides at 24 locations, and nitrogen oxide at one place. The 1971 averages were 5.55 tons/sq km of settling particles/mo; 21 micrograms/cu m of suspended particulates, 0.21 mg of SOx (by the lead dioxide method) or 0.019 ppm (by the electroconductivity method), and 0.045 ppm of NOx. These measurements are generally much lower than other industrial cities of Japan.

30238 **APTIC NO. 52057**

Warren Spring Lab., Stevenage (England)

THE INVESTIGATION OF AIR POLLUTION. DEPOSIT GAUGE AND LEAD DIOXIDE OBSERVATIONS. APRIL 1972 - SEPTEMBER 1972. *26p., 1972.*

The air quality at a number of sites in Great Britain, measured from April 1972 to September 1972, is tabulated. Gauges monitored industrial areas, general deposits, and particular factories in a variety of locations. The major parameters measured were the amount of insoluble material collected in the British Standard Deposit Gauge and the rate of sulfation of the standard lead dioxide cylinder; additional analyses were made at some of the sites. Monthly data, yearly average, and summer average are given.

30239 **APTIC NO. 52174**

Nagoya Municipal Environmental Protection Research Inst. (Japan)

ENVIRONMENTAL POLLUTION IN NAGOYA. PRESENT CONDITIONS. *(Nagoya shi no kankyo osen-kogai gensho no jittai) Text in Japanese. 117p., Jan. 1972.*

The average particulate concentration decreased from about 20 tons/sq m/mo in 1962 to about 10 tons/sq m/mo in 1969, whereas the sulfur oxides concentration increased from 1.2 mg/SO3/100 sq cm lead dioxide/day to about 2.0 mg SO3/100 sq cm/day. The SOx and particulates resulted mainly from 614 boilers and 31 incineration facilities. The total heavy oil consumption in 1967 was approximately 1,400,000 kl, accompanying consumption of 1,460,000 tons of coal and other fuels. There were about 290,000 registered automobiles at the end of 1969, and in pollution by automotive exhaust gases has become one of the major problems. The highest carbon monoxide concentration at the center city area reached 50 ppm in Feb. 1968.

30240 **APTIC NO. 52175**

Hiroshima Prefecture (Japan)

WHITE PAPER ON PUBLIC NUISANCE. *(Kogai hakusho). Text in Japanese. 261p., 1972.*

The sulfur oxides concentrations of the most polluted cities in Hiroshima Prefecture were relatively low, compared to those of the major cities throughout the country. The SOx concentrations, which were measured by the conductivity method ranged from 0.028 ppm in Otake city to 0.034 ppm in Kure city in 1971. The air pollution by automobiles has been becoming more and more serious. At some busy intersections in cities, the carbon monoxide concentrations were higher than environmental standard. The average lead concentration at the Nishibatake intersection of Kure city was 4.69 micrograms/cu m. The municipal government has been enforcing the regulations for public nuisance control, and about 2.4 million dollars was loaned to private industries for fighting pollution.

30241 **APTIC NO. 52450**

Itami Municipal Government (Japan)

A SUMMARY OF POLLUTION CONDITIONS, 1972. *(Kogai no gaikyo, Showa 47-nenban). Text in Japanese. Nov. 1972. 141p.*

The air pollution monitoring system of Itami city, which has a population of about 162,000, consists of automatic detectors for sulfur oxides, nitrogen oxides, carbon monoxide, and airborne particulates, and of measuring apparatus for meteorological conditions, including those in a monitoring vehicle. All results are transmitted to a central control room from which a warning is issued at the time of high pollution concentration. The central control room issues orders and directions to factories. The average sulfur dioxide concentration of 0.026 ppm in 1971, declining from the previous year, was much lower than the environmental standard concentration of 0.05 ppm. The soot and particulate concentrations of the same year were also declining, while the NOx concentration was increasing, compared to previous years.

30242 **APTIC NO. 51893**

Ito, Eiichi and Masaru Kitase

A STUDY OF AIR POLLUTION WITH OXIDANT. *(Okishidanto nodo to sono mondaiten) Text in Japanese. Nagoya-shi Kogai Kenkyusholio (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 1:9-14, Nov. 1972.*

Oxidants, nitrogen oxides, sulfur dioxide, sulfuric acid mists, aldehydes, and other components of smog were measured from July 1971 to June 1972 in Nagoya. From June to October, more than 0.10 ppm of oxidants occurred. From the evening to night, the highest concentrations of pollutants occurred during the autumn and winter. In the summer, higher values occurred in the night than in the day, but in the autumn, there was no difference between the value during the day and during the night. In the summer, oxidant concentrations peaked during the day, in the winter, there was no variation. A high concentration of NOx occurred in the night in the autumn, the concentration of oxidants became high in proportion to the NOx. Although automobiles are the source of NOx, the high concentrations of NOx at night is probably due to the weather.

30243 **APTIC NO. 52348**

Kagawa, Hiroshi, Isamu Gotsu, Tadato Suzuki, Kunihiko Hasumi, Yasuo Abe, Toshimasa Maniwa, Kojiro Shimanuki, Akio Tomita, Masaaki Suzuki, Tadashi Ibohara, Hiroyasu Watanaba, Kenji Anzai, Ichiro Iwahashi, and Ryoji Ochiai

STUDIES ON THE URBAN ATMOSPHERIC POLLUTION BY AUTOMOTIVE EXHAUST GAS IN THE SEVERAL CITIES OF FUKUSHIMA PREFECTURE. *(Fukushima-ken no shuyo toshi ni okeru jidosha haishutsu gasu no taiki kankyo osen ni tsuite). Text in Japanese. Fukushima-ken Eisei Kenkyusho Kenkyu Hokoku (Fukushima Prefect. Inst. Public Health, Rept.). 20(3):43-62, Aug. 1972. 12 refs.*

Urban atmospheric pollution caused by automotive exhaust gas in Fukushima Prefecture was investigated in the summer of 1971 and spring of 1972. Pollutant concentrations of dust, lead, carbon monoxide, sulfur dioxide, hydrocarbons, nitric oxide, and nitrogen dioxide were measured at road sides of five cities along with the number of vehicles passing the test sites. It was determined that the average number of vehicles passing the sites in one hour were: 1070 in Fukushima City, 1945 in Koriyama City, 929 in Nihonmatsu, 882 in Iwaki City, and 520 in Aizuwakamatsu City. Average concentrations of carbon monoxide during the summer were 6.9 ppm, 3.8 ppm, 4.5 ppm, 1.7 ppm, and 5.4 ppm in the above cities, respectively. The carbon monoxide concentrations during the spring were 6.1 ppm, 7.6 ppm, and 2.9 ppm. Average lead concentrations measured were 0.120 ppm, 0.130 ppm, and 0.048 ppm in the spring; sulfur dioxide concentrations averaged at 0.07 ppm, 0.019 ppm, 0.038 ppm, 0.009 ppm, and 0.03 ppm, respectively, in the summer, and 0.031 ppm, 0.040 ppm, and 0.027 ppm in the spring. The average concentration of NO2 were 0.024 ppm, 0.042 ppm, 0.019 ppm, and 0.059 ppm in the summer, while NO average concentrations were 0.137 ppm, 0.087 ppm, 0.045 ppm, and 0.116 ppm in the summer. Average hydrocarbon concentrations were 3.8 ppm, 1.4 ppm, 2.3 ppm, and 3.5 ppm in the summer, and 3.7 ppm and 0.8 ppm in the spring.

30244 **APTIC NO. 51779**

Mallea, M., I. G. Murray, G. Secretain, C. M. Philpot, H. Charpin, E. Gucho, and J. Charpin

CENSUS OF ASPERGILLUS COLONIES IN THE AIR COMPARISON BETWEEN LONDON, PARIS, LYON, MARSEILLES. *Acta Allergol., vol. 27:273-278, 1972. 9 refs.*

The results of sampling the Aspergillus concentrations in London, Paris, Lyon, and Marseilles for 1969-1971 were compared. In all the cities, the Aspergillus colonies were more numerous throughout autumn and winter. London had about twice the amount as compared to the three French cities where concentrations were almost equal. Aspergillus fumigatus was most predominant in London and in Paris. Aspergillus versicolor was rather common in the three French cities but very rare in London, and Aspergillus glaucus was most predominant in Lyon. (Author conclusions modified)

30245 **APTIC NO. 51926**

Mill, R. A., J. M. Robertson, and B. Walker

A TECHNIQUE FOR AIRBORNE AEROBIOLOGICAL SAMPLING. *J. Environ. Health, 35(1):51-53, July-Aug. 1972. 7 refs.*

Airborne aerobiological sampling over the Oklahoma City metropolitan area was done with an Anderson drum sampler fixed to an airplane wing strut. Bacteria and fungi present at 500 ft above ground level were determined for each area of the city by correlating the counts obtained at various points on an agar-coated inner drum with the flight path and the time sequence into the flight. The highest counts were encountered downwind from the metropolitan area. The number of bacteria collected correlated closely with the number of fungi sampled; principal fungi were of the genera Penicillium and Aspergillus. Approximately 30% of bacterial cultures demonstrated hemolysis, indicating that potential pathogens are generated and released to the atmosphere over large cities.

30246 **APTIC NO. 51929**

Mizutani, Hiroo, Akio Kamiya, and Toyomasa Kato

SOME CONSTITUENTS OF AIR BORNE PARTICULATES IN NAGOYA SOUTHERN INDUSTRIAL AREA. *(Nagoya-shi nanbu kogyo chiiki ni okeru taikichu fuyu funjin-chu no kagakuteki seibun ni tsuite). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 1:15-18, Nov. 1972. 4 refs.*

Suspended dust, heavy metals, tars, and water-soluble dust content were measured in Nagoya city from March 11 to 22, 1972 at two locations in the center of the industrial area and one location in Minami Ward. Dust was collected with a hi-vol air sampler; heavy metals in the dust were extracted and analyzed by atomic absorption spectrophotometry. Tar was extracted with acetone; water-soluble constituents were extracted with distilled water to analyze sulfates, nitrates, fluorides, and chlorides. The highest dust concentration was 1078.3 micrograms/cu m in the industrial area. Heavy metals included iron, manganese, copper, lead, and cadmium. The nitrate concentration was about half the sulfate concentration at both measuring stations in the industrial area.

30247 **APTIC NO. 52315**

Schaefer, Vincent J.

FINE PARTICLE MEASUREMENTS IN THE AIR OVER THE NORTH ATLANTIC OCEAN. *J. Rech. Atmospheriques, 6(1-3):507-518, Jan.-Sept. 1972. 12 refs.*

The concentrations of Aitken nuclei, cloud condensation nuclei, and ozone were measured over the North Atlantic Ocean with correlative measurements of wind speed and direction, visibility, pressure, and temperature. Ozone measurements were based on determinations of the particulates produced by the concentration of ozone with several reacting materials, including turpentine, limonene, and iodine. Extremely clean air was found in the air mass over the ocean south of Iceland and Greenland, with the number of Aitken nuclei at less than 300/cu cm. When the air was exposed briefly to the vapor of the reacting materials, extremely high concentrations of Aitken nuclei formed within a few seconds. About 25,000/cu cm of cloud condensation nuclei and over 10 million/cu cm of Aitken nuclei were measured. Except with iodine, the particle formation was not photochemical but occurred as a dark reaction between the cyclic olefins. The sudden formation of the fine particles was attributed to the presence of ozone in clean global air. (Author abstract modified)

30248 **APTIC NO. 52511**

Schedling, J. A.

SULFUR DIOXIDE CONCENTRATIONS MEASURED IN URBAN SURROUNDINGS WITH RESPECT TO EXISTING AND PLANNED INTERNATIONAL LIMIT VALUES. *(Im Grossstadtmilieu gemessene Schwefeldioxidkonzentrationen im Spiegel geltender und geplanter internationaler Grenzwerte). Text in German. Preprint, International Societies for Hygiene Preventive and Social Medicine, Vienna (Austria), 5P., 1972. 1 ref. (Presented at the Joint Meeting of International Societies for Hygiene Preventive and Social Medicine, Vienna, Austria, Oct. 29-Nov. 1, 1972.)*

The atmospheric sulfur dioxide concentration was measured in Vienna beginning in Sept. 1969. Five measuring stations were erected, of which two were located in larger parks surrounding dense residential areas. Three measuring stations were located in the administrative, the university, and the business and residential sections. The conductivity method was mostly used

The measurement was continuously recorded and passed to an integrator which formed half-hourly values. The results of the measurements up to March 1972 are given. Using the average annual concentrations for a comparison with international limit values, in 1971 the U. S. National Ambient Air Quality Standard for SO2 of 0.08 mg SO2/cu m air was exceeded at the administrative and university areas (0.13 and 0.17 mg/cu m). Sixty and 80% of the daily average concentrations at these stations, respectively, were higher than the limit value of 0.15 mg SO2/cu m. This value is used in the neighboring countries to the East and in Turkey. The mean monthly values exceeded in several consecutive winter months the limit value valid in Sweden and Finland (0.125 mg SO2/cu m).

30249 **APTIC NO. 52311**

Slob, W. H.

AIKTEN NUCLEI MEASUREMENTS WITH A MODIFIED SMALL PARTICLE DETECTOR. *J. Rech. Atmospheriques, 6(1-3):537-541, Jan.-Sept. 1972. 1 ref.*

A small particle counter was modified to enable measurements of Aitken nuclei at 4 minute intervals and was tested at two sites at 150 and 500 m from a highway. The data were correlated with diurnal variation scales, wind direction measurements, and traffic density tables. The diurnal variation of the Aitken nuclei concentrations and its dependence on wind direction established that the direct influence of the highway decreased rapidly with distance. (Author abstract modified)

1971

30250 **APTIC NO. 52162**

Schroll, E. and P. Dolezel

BERYLLIUM CONTENT IN SEDIMENTED DUSTS FOR THE URBAN AIR OF VIENNA. *(Ueber den Berylliumgehalt in Staubniederschlaegen der Wiener Stadtatmosphaere) Text in German. Anz. Oesterr. Akad. Wiss. Math.-Naturwiss. Kl., 108(11):148-149, 1971. 3 refs.*

Beryllium was determined in settled dust in Vienna by a spectrographic method, using palladium as an internal reference. The beryllium content in dust samples was highest with 1.0-2.6 ppm during the winter, and especially in samples taken from sampling sites located near major fossil fuel firing installations. The beryllium content of the settled dust originates in coal firing.

ATMOSPHERIC INTERACTION

1973

30251 **APTIC NO. 51883**

Japan Environmental Agency, Bureau of Atmospheric Safety

DATA ON HYDROCARBONS AND RELATED SUBJECTS. *(Tanka suiso kankei shiryo) Text in Japanese. 88p., Feb. 1973.*

There are more than 50 hydrocarbons including aliphatics, alkanes, olefins, acetylenes, cycloalkanes, and aromatic hydrocarbons that have been detected as air pollutants. Results obtained in Los Angeles in 1965 showed that the total hydrocarbon concentration could reach to 5.43 ppm. Various hydrocarbons react with nitrogen oxides to produce ozone, carbonyl compounds, and peroxyacetyl nitrate. Photooxidation of iso-butene, trans-2-butene, cis-2-butene, and 1,3-butadiene with NOx produce high concentrations of ozone in a relatively short time, as high as 1.00 ppm at initial concentrations of HC and NOx at 3 ppm and 1 ppm, respectively. Various regulations including California rule 66, for solvents, the effects of HC and smog on plants, measurement methods, and control methods are discussed.

30252 **APTIC NO. 51948**

Ashby, Eric

POLLUTION ACROSS FRONTIERS: THREE GASES. *Pub. Health Engr., no. 2:37-41, March 1973. 15 refs.*

Case studies of sulfur dioxide, carbon monoxide, and carbon dioxide demonstrate that pollution is not a domestic matter. In Britain, SO2 emissions from power stations and industry are dispersed from high chimneys and carried away on currents which do not return to ground level. The Swedes claim that the SO2 reaches their atmosphere and descends as acid rain on rivers, soils, and forests. Carbon monoxide from car exhausts is not an international problem since it is effectively scavenged by soil microorganisms. However, laws to reduce CO emissions cross frontiers. Britain cannot export cars to the U. S. which do not comply with Environmental Protection Agency standards, and will have to comply with the Common Market standards. An excess of CO2 from combustion of fossil fuels might upset the earth s radiation budget, leading to a rise in world temperature. If the higher temperature increases the amount of water vapor in the atmosphere, there will be more cloud cover, and this could work to cool the earth. Massive and sustained research is required to predict the consequences of increased CO2 production.

30253 **APTIC NO. 52298**

Baum, Howard R.

THE INTERACTION OF A TRANSIENT EXHAUST PLUME WITH A RAREFIED ATMOSPHERE. *J. Fluid Mech. (Cambridge), 58(4):795-815, May 22, 1973. 13 refs.*

The interaction of a gas cloud of specified mass, momentum, and energy with an atmosphere in uniform motion was studied using the kinetic theory of gases. The Krook collision model was used to obtain analytical interpretable and numerically tractable results describing the spatial and temporal evolution of the cloud. The cloud originates from a continuum source and expands to a free molecular flow. It then begins to collide with the atmosphere, and is gradually transformed into a continuum flow diffusing through the atmosphere while being convected by the uniform motion. (Author abstract)

30254 **APTIC NO. 51869**

Bourbigot, Yveline Daix, Jean Bricard, Guy Madelaine, and Dominique Vigla

IDENTIFICATION OF AEROSOLS GENERATED BY PHOTOLYSIS IN THE PRESENCE OF SULFUR DIOXIDE. *(Identification des aerosols produits par photolyse en presence d anhydride sulfureux). Text in French. C. R. Acad. Sci Paris, Ser. D, 276(7):547-550, Feb 1973. 10 refs.*

Reaction products generated by the photolysis of 0.5 cu m of sulfur dioxide and nitrogen dioxide in high-purity nitrogen were identified by the electron diffraction method, and similar products of photolysis in the atmosphere were studied. The photolysis of SO2 and NO2 in nitrogen resulted in the formation of relatively stable aerosol of acidic nitrosyl sulfate. Electron microscopic investigations of different atmospheric samples revealed the presence in free atmosphere of ammonium sulfate particles, smaller quantities of calcium sulfate, and nitrosyl sulfate, with the latter absent in ammonia-rich atmosphere. Conversion of nitrosyl sulfate into sulfates due to the presence of water vapor and other contaminants was determined.

30255 **APTIC NO. 52208**

Burgmeier, James W., I. H. Blifford, Jr., and Dale A. Gillette

A REINFORCED COAGULATION-SEDIMENTATION AEROSOL MODEL. *Water, Air, Soil Pollut., 2(1):97-104, March 1973. 12 refs.*

A numerical model was constructed to simulate the aging of the aerosol size distribution in the presence of sources. The model incorporated the mechanisms of thermal coagulation and gravitational sedimentation and continuously replaced the mass lost due to sedimentation with particles distributed similarly to the initial distribution. The model showed that stable size distributions cannot contain excessive numbers of large particles and that particles of radius less than 0.1 micron require a continuous source to remain in high concentrations. (Author abstract)

30256 **APTIC NO. 51743**

Cox, R. A.

PREDICTIONS OF FOG FORMATION DUE A WARM WATER LAGOON PROPOSED FOR POWER STATION COOLING. *Atmos. Environ., 7(3):363-368, March 1973. 2 refs.*

A method was proposed to predict the severity of fogs caused by steaming of a warm water lagoon used for power station cooling. The method was applied to a hypothetical case and incorporated the behavior of the weather, the physics of steaming, and visibility considerations. Wind strength and direction and temperature were the major meteorological parameters.

30257 **APTIC NO. 51857**

Cramer, J.

MODEL OF THE CIRCULATION OF DDT ON EARTH. *Atmos. Environ., 7(3):241-256, March 1973. 50 refs.*

A model was developed to predict the global distribution and accumulation of DDT. The model considers the land, atmosphere, shallow sea and aquatic plankton as reservoirs for DDT. Reasonable values for the rates of transfer between reservoirs and rates of chemical and biological degradation of DDT are estimated. The parameters of the model were systematically varied in an attempt to determine the parameters of most critical importance to the predicted results. Two hypothetical alternative rates of future DDT usage are considered. There are: continued constant rate of DDT usage at 1970 level; and zero rate of DDT usage after 1970. The time required to return to equilibrium after the termination of DDT usage cannot be precisely determined, but lies somewhere between about 25 and 110 years. Most of the decrease in the concentration levels of DDT, however, occurs in the early years. It appears that the concentration of DDT in marine life is already near its equilibrium value and should not increase significantly in the future. The rates of degradation of DDT, the amount of DDT which enters the atmosphere, the rates of transfer between the deep and shallow seas and the rates of direct absorption of DDT by phytoplankton and zooplankton are critical factors in a model of DDT circulation and distribution. Research emphasis should be concentrated in these areas. (Author abstract modified)

30258 **APTIC NO. 52034**

Dmitriev, M. T., L. Yu. Ivanova, and Chon En De

HYGIENIC PROGNOSIS OF THE PHOTOCHEMICAL SMOG FORMATION IN TOWNS. *(Gigiyenicheskoye prognozirovaniye obrazovaniya fotokhimicheskogo smoga v gorodakh). Text in Russian. Gigiena i Sanit., no. 2:8-13 Feb. 1973. 5 refs.*

General problems of forecasting photochemical smog formation in towns of the USSR are discussed. Relatively high concentrations of certain air pollutants in the atmosphere, and ultraviolet radiation in a wavelength range of 320-330 nanom are necessary for photochemical smog to form. The rate of the photochemical reactions should be higher than 0.35 mg/cu m/hr for the formation of photochemical smog. The photochemical reactions have their maximum rate during the noon hours of the day in June in the northern towns, and in July and August in southern towns of the USSR. A method for forecasting photochemical smog formation at different times of the year and day, and in different geographic zones and at various pollutant levels was developed. Decrease in the maximum rate of photochemical smog formation and in the number of smog days with increasing latitude was determined. The possibility of photochemical smog formation is excluded if existing emission standards are satisfied. With carbon monoxide, nitrogen dioxide, and Hydrocarbon concentrations at the respective maximum allowable concentrations, i.e., 1 mg/cu m, 0.085 mg/cu m, and 3 mg/cu m, the maximum rate of photochemical reactions even in southern cities of the USSR is at 0.018 mg/cu m/hr, compared to 0.35 mg/cu m/hr.

30259 **APTIC NO. 51954**

Elgmork, Kare, Arne Hagen, and Arnfinn Langeland

POLLUTED SNOW IN SOUTHERN NORWAY DURING THE WINTERS 1968-1971. *Environ. Pollut., 4(1):41-52, Jan. 1973. 4 refs.*

In recent years the snow in southern Norway has been laminated with conspicuous grey bands which were considerably more acidic, had a higher electrical conductivity, larger amounts of sulfur, heavy metals, and other elements than the white layers of the snow. These bands indicate a considerable airborne pollution with values of S up to 8.5 mg/l and of lead up to 98 micrograms/l, and with pH values down to 3.25 in the melt water. The chemical stratification in the snow was well preserved throughout the winter in areas with a cold climate. A regional study of the snow in late winter may thus give information of the distribution of airborne pollution. The acidity and contents of chemical substances in the snow was too high and found over too wide an area to have been produced in Norway. The pollution must have been brought in by low pressure systems from the great industrial and urban areas in western and central Europe. (Author abstract)

30260 **APTIC NO. 51729**

Eschenroeder, Alan and Carolyn Belman

MATHEMATICAL MODELS OF SMOG. *Simulation, 20(2):41-44, Feb. 1973. 14 refs.*

The application, construction, and use of mathematical models are reviewed, and a smog simulation model is presented. The factors involved in simulating air pollution include the source with respect to operating variables and emission variations; meteorological parameters; and the chemical reactions of pollutants. The urban mathematical model of photochemical smog incorporated the chemical mechanism using experimental smog chamber data and actual data from the Los Angeles area; data on engine exhausts and operating variables; and meteorological measurements.

30261 **APTIC NO. 52345**

Fischer, K.

MASS ABSORPTION COEFFICIENT OF NATURAL AEROSOL PARTICLES IN THE 0.4 TO 2.4 MICRON WAVELENGTH INTERVAL. *Beitr. Physik Atmosphaere, 46(2):89-100, 1973. 13 refs.*

Theoretical investigations have predicted that absorption of solar radiation by particulate matter suspended as aerosol particles in the air plays an important part in the radiation budget of the atmosphere. In the present study, the mass absorption coefficient (i.e., the imaginary part of refractive index related to density) was determined for the 0.4-2.4 micron wavelength interval. The measurements were performed on films of aerosol particles which were collected by an automatic jet impactor at several urban and remote sites. An integrating sphere technique was used to measure the absorption taking into account the scattering by the particle collections. Apart from some weak absorption bands of liquid water adsorbed by the particles, the values of the mass absorption coefficient ranged from .001 to .01 cu cm/g, indicating so-called grey absorption. These values were related to 35% relative humidity prevailing during the measurements. (Author abstract modified)

30262 **APTIC NO. 51763**

Garratt, J. R. and G. I. Pearman

LARGE-SCALE CO_2 FLUXES IN THE SOUTHERN HEMISPHERE TROPOSPHERE. *Nature Phys. Sci., 242(117):54-56, March 26, 1973. 11 refs.*

The vertical profile of atmospheric carbon dioxide fluxes in the southern hemisphere troposphere was investigated. Between June and Sept. 1972 an average increase of 0.4 ppm was observed from 4-10 km, suggesting a downward transfer of CO_2 through the troposphere. Between November 1972 and February 1973 an average decrease of the same magnitude was established, suggesting an upward transfer of CO_2. The large scale vertical transfer of CO_2 in the troposphere was essentially controlled by turbulent processes. The magnitude of the observed vertical gradient and its seasonal variation was accounted for by the seasonal changes in ocean surface temperature. The mathematical calculations and supporting data are examined.

30263 **APTIC NO. 52410**

Grassl, H.

SEPARATION OF ATMOSPHERIC ABSORBERS IN THE 8-13 MICROMETER REGION. *Beitr. Physik Atmosphaere, 46(2):75-88, 1973. 10 refs.*

From sky emission data measured with a five-channel radiometer in the 8-13 micron region, four different atmospheric absorbers could be separated. The continuum absorbers numbered following their importance in midlatitudes are: the e-type absorption dependent on the water vapor pressure, aerosol absorption, and water vapor continuum absorption. The fourth absorption, strongly dependent on wavelength, is caused by lines of water vapor and other minor constituents. Excellent agreement between already existing laboratory data and the data presented herein was found for the e-type absorption. A statistical evaluation following the least squares method for about 80 measurements was used to get sufficient accuracy. The large amount of e-type absorption has consequences on radiative flux divergence calculations and the determination of surface temperatures from satellites. In temperate and cold climates the aerosol absorption can be of equal importance. (Author abstract modified)

30264 **APTIC NO. 52148**

Grib, N. K. and I. I. Polyak

SOME STATISTICAL CHARACTERISTICS OF THE MEASUREMENT OF ATMOSPHERIC OZONE. *(Nekotoryye statisticheskiye kharakteristiki izmereniy atmosfernogo ozona). Text in Russian. Meteorol. i Gidrol., no. 4:87-93, April 1973. 14 refs.*

Stationary measurements of atmospheric ozone and of sunspot activity were performed to study a possible statistical relationship between the total ozone concentration and sunspot activity. Pronounced annual patterns of the ozone concentrations with a trend of increased dispersion of the measured values during the winter and spring was observed. The sunspot activity, showing 11-year-cycles, fluctuated at periods of 29 days each. Spectral densities of timed series of ozone and sunspot area measurements wery determined. The spectra obtained demonstrated no direct relationship between the total ozone concentrations and the sunspot area.

30265 **APTIC NO. 51856**

Hagen, L. J. and N. P. Woodruff

AIR POLLUTION FROM DUST STORMS IN THE GREAT PLAINS. *Atmos. Environ., 7(3):323-332, March 1973. 8 refs.*

Great Plains states are adopting air pollution regulations to limit particulate concentrations. Because little information is about dust storms, an important source of particulates in those states, hourly observations of the weather on dusty days during the 1950 s at 37 weather stations were analyzed. Wind direction was southerly, and windspeeds were usually 8.9-13.4 mi/sec; relative humidity was less than 70 in 92% of the dusty hours. During periods of low precipitation, most Great Plains locations had a significant number of hours with dust. The study revealed that the median annual hours of dust was 45, but more than 150 dusty hours were recorded in 20% of the reports. Though urban air pollution episodes last longer than dust storms, dust storms have larger particles and higher particulate concentrations. The average dust storm lasted 6.6 hr, and median dust concentration was 4.85 mg/cu m. Because of high concentrations of coarse particles in dust storms, air pollution laws in the Great Plains probably should specify particulate size distributions to which various sections of the laws apply as well as limits on particulate concentrations. (Author abstract modified)

30266 **APTIC NO. 52007**

Hendel, F. J.

AEROTHERMOCHEMISTRY OF THE TERRESTRIAL ATMOSPHERE. *CRC Critical Rev. Environ. Control, 3(2):129-152, Feb. 1973. 50 refs.*

Many publications dealing with aerothermochemistry of the terrestrial atmosphere are critically reviewed. The original meaning of aerothermochemistry was the science dealing with important chemical phenomena that enter the problems of flow of air at high speeds around flight vehicles or their models in wind tunnels. The original meaning was expanded to many other exothermic and endothermic chemical reactions occurring naturally and/or artificially in the lower and upper atmosphere. The present meaning of aerothermochemistry helps in understanding many thermochemical phenomena occurring continuously and/or sporadically in the atmosphere. Various photochemical and chemical reactions are described, including those involving ozone, nitrogen oxides, and ions. Reaction rates are mentioned. Emissions from automobiles, aircraft, and rockets are mentioned.

30267 **APTIC NO. 52472**

Hesstvedt, Eigil

EFFECT OF WATER VAPOR AND NITROGEN OXIDES UPON THE OZONE LAYER. *Water, Air, Soil Pollut., 2(1):49-60, March 1973. 11 refs.*

A theoretical meridional model of the ozone layer is presented. Two-dimensional transport by eddies and mean motion is considered together with photochemical reactions involving oxygen, nitrogen, and hydrogen. The model is used to evaluate the effect of increased content of water and nitrogen oxides in the stratosphere. A doubling of stratospheric humidity will reduce the total amount O_3 by less than 1%, while a doubling of NO_x will result in an 18% reduction for middle latitudes and summer. A 10% increase in NO_x will reduce the total O_3 by about 2.8%. The relations between ultraviolet radiation and total O_3 are described, in particular, for wavelengths of biological interest (290 to 320 nm). A 1% decrease in total O_3 will result in a 2% increase in erythemogenic UV radiation. (Author abstract modified)

30268 **APTIC NO. 52160**

Hidy, G. M. and J. R. Brock (ed(s).)

TOPICS IN CURRENT AEROSOL RESEARCH, PART 2. *New York, Pergamon Press, 1973, 392p. 391 refs.*

Two main topics are discussed dealing in considerable depth with the theory of diffusiophoresis and thermophoresis and with the mathematical treatment of integrodifferential equations from the aerosol coagulation. The first topic by Derjaguin and Yalamov provides considerable insight into the methods used by these investigators to derive a theory for thermophoretic and diffusiophoretic forces acting on aerosols and on gases on a solid surface in the range from free molecule to continuum behavior. The analysis differs substantially from other recent theoretical calculations. The second topic by Drake reviews in detail for the first time the extensive literature on the mathematical solutions for the kinetic model of the coagulation equation. The older and recent methods to calculate size distribution functions for clouds of particles undergoing collisions are expanded, along with gravitational settling, and other physical processes. It should be useful as a guide to the aerosol scientist in treating the coagulation problem. It surveys the collision process in the light of aerosol behavior and it bears on the development of droplet size distributions in clouds containing hydrometers. (Author abstract modified)

30269 **APTIC NO. 52182**

Horie, Y. and L. T. Fan

AIR-POLLUTION FORECASTING BY AN ADAPTIVE METHOD. *Simulation, 20(4):119-125, April 1973. 18 refs.*

The unsteady state of urban air pollution is described by a simple first-order ordinary differential equation that is derived from the fundamental equations of fluid-dynamics under the assumptions of homogeneity of source distribution and horizontal concentration distribution. The short-term prediction of a regional average concentration is carried out for a 4-day period based on the unsteady-state equation with use of an adaptive prediction method. One-to six-hour predictions of the regional average concentration are in good agreement with the observed concentrations. (Author abstract)

30270 **APTIC NO. 51961**

Huebschmann, Wolfgang, Lothar Kropp, Hans Lenhardt, Klaus Nester, and Josef Ottes

DIGITAL COMPILATION OF METEOROLOGICAL MEASUREMENT VALUES. *(Digitale Datenerfassung meteorolgischer Messwerte). Text in German. Staub, Reinhaltung Luft, 33(6):245-248, June 1973. 2 refs.*

In the nuclear research center in Karlsruhe, West Germany, a 200 m measurement tower is in operation for the purpose of measuring the meteorological parameters in the lower atmosphere important for atmospheric diffusion. Measurements are being taken on 10 different levels of the tower and in a nearby meadow. The following parameters are being measured: wind speed, wind direction, dew point, temperature, atmospheric pressure, precipitation, and solar radiation. The wind velocity is measured with a shell anemometer. A rotating slotted disk produces light flashes whose frequency is a measure of the circumferential velocity of the shell star. This digital information is directly processed by the computer. The wind direction is measured on six elevations. The relative humidity is determined by lithium chloride sensors on four different elevations. The temperature is measured directly and not by temperature difference measurements. All data are transmitted to the 250 m distant computer center. The results of a first evaluation of temperature measurements are given with respect to the occurrence of high-level inversions. High-level temperature inversions occurred 2.7% of the time under consideration. With respect to the diurnal characteristics, the largest frequency maximum of high-level inversions occurred between 6:30 and 7:00 am, exactly when the largest decrease of ground-level inversions occurred. The frequency of high-level inversions decreases slowly toward afternoon. In the late afternoon and night, higher elevation inversions occur on the average only during 1% of the time. Between 10 am and 3 pm the number of higher elevation inversions is larger than of ground-level inversions. A total of 166 higher elevation inversions were observed which lasted between 0.5 and 16.5 hours.

30271 **APTIC NO. 52496**

Imboden, Dieter M. and Werner Stumm

THE GEOCHEMICAL CYCLES OF THE ATMOSPHERE AS AFFECTED BY MAN. *(Der Einfluss des Menschen auf die geochemischen Kreislaeufe in der Atmosphaere). Text in German. Chimia, 27(3):155-165, March 1973. 36 refs.*

The influence of materials introduced into the atmosphere by man on geochemical cycles is assessed, and the relationship between an atmospheric load of industrial wastes and corresponding water pollution is examined. Land, water, and the atmosphere are connected together by hydrogeochemical cycles in a complex manner. The effect of man and of its civilization on these cycles can be assessed quantitatively by comparing the material flux caused by civilization with that of natural material circulation. Examination of the sulfur cycle and that of mercury has demonstrated that these cycles are of the same order of magnitude or even greater than corresponding natural cycles. Thus, of sulfur transported by rivers into the sea, one-third comes from the sea (recirculation), one-third from erosion, and one-third from the combustion of fossil fuels. While sediments in the Brienzersee lake, located in an unpolluted part of Switzerland, contain 200 ppb Hg, those of the Rhone river flowing through industrial regions contain 600 ppb. The atmosphere acts as a means of transport for the rapid mixing of the geosphere with pollutants and for the introduction of certain pollutants (hydrocarbons, lead, and acidity) into inland waters. Marine aerosols are clearly enriched by metals stemming from the combustion of fossil fuels. When the annual production of a metal (extraction from the ground) exceeds its annual elimination (sedimentation velocity in the sea) then potential polluting of the ecosphere must be expected. In Switzerland the material balance for lead and mercury reveals that their artificial man-induced cycles are more important than their corresponding natural cycles.

30272 **APTIC NO. 52510**

Imhoff, Claude and Eric Desbaumes

INFLUENCE OF ATMOSPHERIC POLLUTION ON PRECIPITATION. *(Influence de la pollution atmospherique sur les precipitations). Text in French. Staub, Reinhaltung Luft, 33(6):241-245, June 1973. 11 refs.*

Local pollution sources influence the composition of precipitation which are dependent on meteorological factors. A year long study conducted in the Geneva area was designed to correlate the atmospheric pollutants sulfur oxides, nitrogen oxides, hydrocarbons, and chlorine with sulfates, nitrates, HC, and chlorides in rain water and snow. Air samples were collected in teflon bags, rain and snow in pluviometers. Atmospheric NOx did not show great variation in the city itself, the annual mean was 33.65 ppb + or 13 ppb; in the country it was 18.05 ppb. The average 30-day concentration of sulfur dioxide in the city was 33.28 mg, at a distance of 10 to 20 km from the city it was 10.00 mg with concentrations showing strong seasonal variations. By comparing concentrations in the city, in the country, and at an elevation of 1000 m, it was found that each pollutant behaves differently. In the case of HC, the lowest concentrations were found at 1000 m, sulfates and nitrates attained their highest concentrations at 1000 m elevation in November, while concentrations of chlorinated hydrocarbons increased during certain periods which coincided with western winds. These winds obviously brought with them chlorinated hydrocarbons of foreign origin. After a rain, the NOx content decreased by about 22 ppb. No simple correlation existed between concentrations of nitrates in rain water and the reduction of NOx concentration in the atmosphere after a rain.

30273 **APTIC NO. 52407**

Johnson, W. B., F. L. Ludwig, W. F. Dabberdt, and R. J. Allen

AN URBAN DIFFUSION SIMULATION MODEL FOR CARBON MONOXIDE. *J. Air Pollution Control Assoc., 23(6):490-498, June 1973. 17 refs.*

A simple Gaussian-type diffusion simulation model for calculating urban carbon monoxide concentrations as a function of local meteorology and the distribution of traffic is described. The model can be used in the synoptic mode, in which hourly concentrations at one or many receptor points are calculated from historical or forecast traffic and meteorological data, or in the climatological mode, in which concentration frequency distributions are calculated on the basis of long-term sequences of input data. For model evaluation purposes, an extensive field study involving meteorological and air-quality measurements was conducted during Nov.-Dec. 1970 in San Jose, Calif., which has an automated network to provide traffic data throughout the central business district. Model refinements made on the basis of received data included the addition of a street canyon submodel to compensate for the aerodynamic effects of buildings on CO concentrations at streetside receptors. Evaluation of the revised model showed that calculated and observed concentration frequency distributions for street-canyon sites were in good agreement. Hourly average predictions were well correlated with observations (correlation coefficient about 0.6-0.7), and about 80% of the calculated values were within 3 ppm of the observed hourly average concentrations which ranged as high as 16 ppm. (Author abstract)

30274 **APTIC NO. 52061**

Laktionov, A. G., Yu. S. Lyubovtseva, and M. S. Malkevich

SOME STATISTICAL CHARACTERISTICS OF AEROSOL MICROSTRUCTURE IN THE ATMOSPHERIC SURFACE LAYER. *(Nekotoryye statisticheskiye kharakteristiki mikrostruktury aerozolya v prizemnom sloye atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 9(2):138-144. Feb. 1973. 13 refs.*

Average distributions of particles, root-mean-square deviations, and covariance matrices were obtained from photoelectric measurements of integral and differential distributions of haze and fog particles. Sharp decrease in concentration with increasing particle size was determined. Both the concentration of small particles (below 8 micron) and the total integral concentration of particles was several times higher in fog than in haze. The negative correlation coefficients for small and large particle sizes are in agreement with earlier data on negative covariance of scattering functions for small and large scattering angles. The data obtained evidence quantitative relationship between correlation functions of aerosol parameters and optical parameters.

30275 **APTIC NO. 51990**

Lamb, Robert G.

NOTE ON THE APPLICATION OF K-THEORY TO DIFFUSION PROBLEMS INVOLVING NONLINEAR CHEMICAL REACTIONS. *Atmos. Environ., 7(3):257-263, March 1973. 1 ref.*

A simple extension of Prandtl's mixing length theory is developed and used to derive a set of sufficient conditions for the validity of the diffusion equation which is commonly used to model chemically reactive pollutants in urban atmospheres. It is pointed out that these conditions are violated in the vicinity of strong, localized sources such as smoke-stacks and highways. (Author abstract)

30276 **APTIC NO. 52505**

Le Quinio, R.

HOURLY CONCENTRATIONS OF POLLUTANTS FROM POINT SOURCES NEAR THE GROUND: A PROBABILISTIC APPROACH. *(Concentrations sur une heure de pollutants a des emissions ponctuelles pres du sol-presentation probabiliste). Text in French. Atmos. Environ., 7(4):423-428, April 1973. 6 refs.*

Results of atmospheric diffusion experiments from a point source are presented in a stochastic form. A tracer uranine (disodium fluoresceine) was emitted over 1.5 hr to simulate continuous emission. The site of emission was the top of a pylon e few meters high to simulate a future site or the interior of a stack of an existing installation. Forty or more autonomous measuring instruments were placed downwind at various distances from the source, and the aerosols retained on their filters during pumping for a period of 1 hour represented the maximal concentration of the pollutant at the given distance. In this manner, 49 daylight and 25 nighttime determinations were made for the distance of 2500 m and 33 respectively, and seven determinations for the distance of 11,000 m downwind from the source. Mean hourly concentrations X/Q (X equals mean hourly concentration in g/cu m, Q equals the volume of continuous emission in g/sec) followed log-normal laws with standard deviations similar for different distances between 1 and 12 km. In this way a number of problems can be solved, like what are the concentrations at different distances for a given situation, or what is the probability of exceeding a given concentration for a given distance, or what is the distance for a given concentration where this concentration is likely to be exceeded.

30277 **APTIC NO. 52305**

Ludwig, F. L., R. C. Sandys, and A. E. Moon

A PRELIMINARY STUDY OF MODELING THE AIR POLLUTION EFFECTS FROM TRAFFIC ENGINEERING ALTERNATIVES. *J. Air Pollution Control Assoc., 23(6):499-504, June 1973. 12 refs.*

The design and application of three mathematical models combined to calculate the changes in carbon monoxide concentration that might result from traffic engineering changes were examined. A composite of the dynamic highway transportation model (DHTM) which relates traffic flow patterns to physical parameters and traffic signal characteristics, an emission model to predict CO emissions from traffic flow parameters, and the APRAC-1A urban diffusion model which calculates CO concentrations from source distributions and meteorological factors was tested using data on traffic in downtown Chicago for a specific set of meteorological conditions, and the results were compared for two traffic signal control schemes. In those blocks where concentrations were highest, the model determined a possible 20% reduction through improved traffic signal controls. (Author abstract modified)

30278 **APTIC NO. 51980**

Munn, R. E.

A STUDY OF SUSPENDED PARTICULATE AIR POLLUTION AT TWO LOCATIONS IN TORONTO, CANADA. *Atmos. Environ., 7(3):311-318, March 1973. 4 refs.*

The frequency distributions of daily suspended particulate values at two stations in Toronto are examined, as well as the weekly and seasonal cycles. Using the wind at a height of 120 m (obtained from an anemometer mounted on a television tower in the downtown area), a meteorological interpretation of the variations in air quality is obtained. Using subsets of days when wind direction remained within designated sectors, it is found that the poorest air quality was associated with S-SSW winds, the best with N-NNE winds. An analysis of the surface synoptic weather patterns accompanying the 14 days with highest particulate values at the two stations revealed that most high values occurred with a warm SSW flow associated with an anticyclone located over the eastern United States. (Author abstract)

30279 **APTIC NO. 52164**

Naudascher, Eduard and Helmut Kobus

EXPLORATION OF STREAM-RELATED PROBLEMS OF ENVIRONMENTAL POLLUTION. *(Erforschung von Stroemungsproblemen der Umweltverschmutzung). Text in German. Umschau (Frankfurt), 73(6):165-171, March 1973. 10 refs.*

Problems of diffusion, dispersion, and transport phenomena in fluid flows relevant to engineering problems of environmental pollution are studied in a newly established Research Center at the Karlsruhe University (West Germany). The research program is aimed at providing a basis for predicting the spreading of waste or cooling water in rivers or stack emissions in the atmosphere, for controlling ecological and morphological changes in water bodies, and for developing new techniques for environmental protection. A promising process, applying smoke cannon for the periodical discharge of high-energy puffs of smoke rings, instead of continuous smoke emission in industrial plants, has been developed. The smoke-rings thus discharged are carried away over long distances due to their kinetic energy, and are able to pierce inversion layers, and thus reaching high altitudes. The problem of the stability of such smoke rings in turbulent atmosphere is being studied in hydraulic model experiments.

30280 **APTIC NO. 51746**

Pueschel, R. F., B. A. Bodhaine, and B. G. Mendonca

THE PROPORTION OF VOLATILE AEROSOLS ON THE ISLAND OF HAWAII. *J. Appl. Meteorol., 12(2):308-315, March 1973. 12 refs.*

Nephelometry, in conjunction with a tube furnace and an Aitken nuclei counter, was applied to the investigation of the volatile component of the aerosol budget at Hilo and Mauna Loa Observatory in Hawaii. The heating of the incoming air sample resulted in a decrease in light scattering above 100 deg C due to the loss of organics and other easily volatilized compounds, and in a drastic increase in Aitken nuclei counts at temperatures above 150 deg C in the presence of ammonium sulfate. In the marine aerosol, a decrease in light scattering at about 45 deg C was observed which was probably due to the loss of moisture during the phase transition from droplet to crystal. A second decrease near 120 deg C was probably caused by the volatilization of organics from the oceanic aerosol. In heating to 150 deg C, the amount of light scattering decrease depended on the air mass. On occasions when volcanic effluent was present, an increase in Aitken nuclei was noted in the heated air. Total aerosol mass deduced from light scattering measurements before heating was in good agreement with aerosol mass measurements determined by standard high-volume filter sampling techniques. The total amount of aerosols in the air mass above the trade inversion was comparable to the quantity found in the marine air mass. After penetrating the trade inversion, the cation content of the air was significantly reduced and the aerosol volatility was increased. (Author abstract)

30281 **APTIC NO. 51986**

Randerson, Darryl

A SUMMARY OF HOURLY TURBIDITY MEASUREMENTS FOR LAS VEGAS, NEVADA, DURING FALL MONTHS. *Atmos. Environ., 7(3):271-279, March 1973. 11 refs.*

Over 800 hourly turbidity measurements taken in Las Vegas, Nevada, on 106 days during the Fall of 1970 were analyzed. The mean turbidity for 1970 was 0.042; that for 1971 was 0.038. Turbidity values ranged from a maximum of 0.133 in heavy haze or pollution on Oct. 6, 1970 to a minimum of 0.009 in a fresh continental polar air mass on Sept. 22, 1970. Statistical analyses of the turbidity observations showed a preference for maximum turbidity at local noon with minimums occurring near 0700 and 1600 Pacific Standard Time. It is recommended that turbidity be measured at standardized local sun-time when Volz sunphotometers are used. Turbidity is analyzed versus optical air mass. (Author abstract modified)

30282 **APTIC NO. 51967**

Rolfe, Gary L., Amar Chaker, John Melin, and Ben B. Ewing

MODELING LEAD POLLUTION IN A WATERSHED-ECOSYSTEM. *J. Environ. Syst., 2(4):339-349, Dec. 1972. 4 refs.*

Understanding and modeling the movements and effects of heavy metals (initially lead) in the environment are presented. A model has been constructed which simulates the movements and predicts the accumulation points of lead in a 76-square mile watershed-ecosystem in Champaign County, Illinois. The model includes components of both aquatic and terrestrial ecosystems, and represents the ecosystem by a network of nodes and branches where the nodes represent the components of the ecosystem in a general sense and the branches indicate possible transport mechanisms between nodes. Results of a two year simulation using a network of 36 nodes and 121 branches is presented. The model provides a method for the study of pollutant transport and accumulation in ecosystems. (Author abstract modified)

30283 **APTIC NO. 52055**

Roosen, Robert G., Ronald J. Angione, and Clara H. Klemcke

WORLDWIDE VARIATIONS IN ATMOSPHERIC TRANSMISSION: 1. BASELINE RESULTS FROM SMITHSONIAN OBSERVATIONS. *Bull. Am. Meteorol. Soc., 54(4):307-316, April 1973. 42 refs.*

Analysis is made of atmospheric transmission measurements taken during the first half of the twentieth century at 13 widely separated sites by the Astrophysical Observatory of the Smithsonian Institution. Long and short period variations in atmospheric transmission are examined for the individual sites. Significant variations from one day to the next are not unusual. Seasonal variations are found for all sites, with characteristic summer maxima. The variations appear to be due almost entirely to variations in the aerosol component above the observing sites. The observed phases of these variations, the derived characteristic size distributions of the particles which cause them, and the correlations between atmospheric moisture and transmission lead to the conclusion that differences in the nature and sources of aerosols above arid and vegetated regions are detectable. More recent studies indicate that, except for sporadic perturbations due to volcanic activity, there has been no detectable change in the global atmospheric transmission measured from remote, high altitude sites in the last half century. (Author abstract modified)

30284 **APTIC NO. 51748**

Sabersky, Rolf H., Daniel A. Sinema, and Fredrick H. Shair

CONCENTRATIONS, DECAY RATES, AND REMOVAL OF OZONE AND THEIR RELATION TO ESTABLISHING CLEAN INDOOR AIR. *Environ. Sci. Technol., 7(4):347-353, April 1973. 26 refs.*

The concentrations, decay rates, and removal mechanisms of ozone within buildings were investigated. Transitory O3 concentrations within typical buildings located in photochemically smoggy areas lagged in time and were only a little less in value as compared to corresponding outdoor concentrations. The O3 decomposition within the buildings involved a heterogeneous mechanism. Decomposition rate constants for several common surfaces ranged within about 0.1-0.001 cu ft/sq ft-min. Rubber, fabrics, and plastics decomposed O3 much more rapidly than metals and glass in laboratory experiments. The effectiveness of various filters in destroying ozone was also studied experimentally. A theoretical model was developed to permit the correlation of indoor versus outdoor O3 concentrations as a function of time. (Author abstract modified)

30285 **APTIC NO. 52514**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 2. *(Veiligheidssystemen en luchtverontreiniging. 2). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(7):219-224, 1973.*

Factors influencing the diffusion and dispersion of flue gas plumes, as well as procedures and formulae for the determination of the ground level concentrations of pollutants discharged by stacks are presented with special regard to the petroleum processing industry. The Pasquill, Sutton, and American Petroleum Institute methods for the calculation of pollutant concentrations are presented. The Pasquill method is unsuitable for concentration determination at great distances from stacks. The turbulence coefficients as determined by Sutton for large lapse conditions, neutral conditions, mild inversion, and strong inversion are 0.20, 0.25, 0.30, and 0.50, respectively. The American Petroleum Institute method applies for discharge rates exceeding 150 m/sec. An example demonstrating the calculation of the stack diameter and stack height for stacks emitting ethylene dichloride at 120 C and at a rate of 100 t/hr by the Pasquill, Sutton, and American Petroleum Institute methods evidences apparent advantages of the latter method. Ground level concentration determinations should relate to a wind speed below 2 m/sec, since most pollution-related nuisances occur under such conditions. Thus, the wind speed used for calculations by the API method is 0.45 m/sec.

30286 **APTIC NO. 52323**

Sekera, Zdenek and Larry L. Stowe, Jr.

EFFECTS OF PARTICULATE MATTER ON THE RADIANCE OF TERRESTRIAL INFRARED RADIATION: THEORY. *Beitr. Physik Atmosphaere, 46(2): 101-111, 1973. 8 refs.*

A first step for quantitative estimate of the effect of atmospheric turbidity on terrestrial radiation is to solve radiative transfer in an inhomogeneous atmosphere with imperfect scattering irradiated by internal sources only. The previously formulated theory of radiative transfer in an inhomogeneous, plane-parallel atmosphere with imperfect scattering irradiated by internal sources only is extended to include the effect of a perfectly absorbing and emitting lower boundary. The radiance of the emerging scattered radiation is expressed as the solution of the auxiliary equation, considerably simplified by developing the source function into a series of Legendre polynomials in mu (cosine of zenith angle of emerging radiation). This has reduced the auxiliary equation to a simple Milne s integral equation with the optical thickness as the only independent variable. (Author abstract modified)

30287 **APTIC NO. 51784**

Spiller, Lester L.

SOLVENTS AS AIR CONTAMINANTS. *Am. Paint J., 57(52):26-27, 70-71, June 11, 1973. 5 refs.*

The recognized variability of individual chemical group classifications in their contribution to photochemical air pollution requires that some measure of this variable be developed in order to determine which organic compounds should be controlled. Identification of major organic pollutants on a national scale would serve to define the total magnitude of the problem. It is possible that the 20% reactivity classification for solvent evaporation emissions given by Rule 66 may be too low to represent that national solvent usage. From a control standpoint, it is desirable that olefins and aromatic hydrocarbon levels in solvents be reduced as much as possible. Reducing the content of paraffinic hydrocarbons or benzene does not appear to be justified on the basis of reactivity considerations alone. The present status of EPA technology is sufficient to suggest that control measures can be modified from the present gross emission standards to some kind of nationwide base line control on solvents. (Author summary modified)

30288 **APTIC NO. 52321**

Stuemke, Hermann

DISPERSION OF STACK GASES PARALLELLY TO A RIDGE AND A VALLEY PART I. *(Ausbreitung von Schornsteingasen in einer Parallelstroemung mit ein-oder vorspringende Kante - Teil I). Text in German. Staub, Reinhaltung Luft, 33(6):249-253, June 1973. PART II. Ibid., 33(7):286-290, July 1973. 7 refs.*

The diffusion of chimney gases in turbulent air is considered with the assumption of an uniform average parallel stream between two walls which intersect on the edge K under the angle alpha. Primarily the position of the source is given by the angle mu alpha/2 between the perpendicular from the source to the edge K and the next wall. Assuming stationary Fickian diffusion, the position and the size of the maximum which the concentration of noxious gases attains of the ground, are characterized by three coefficients depending only alpha and mu. These coefficients are calculated for the interval O less than alpha less than two pi, O less than mu less than 1, either by the method of reflected sources or by the method of differences, and are represented in diagrams. The results are illustrated by a numerical example concerning the iterative calculation of the effective chimney height.

30289 **APTIC NO. 51802**

Tetzlaff, G.

RADIATION MEASUREMENTS IN THE CENTRAL SAHARA (TIBESTI). *(Strahlungsmessungen in der zentralen Sahara (Tibesti)). Text in German. Meteorol. Rdsch., 26(3):80-81, 1973. 6 refs.*

Radiation measurements were made in the central Sahara during the spring of 1967. The maximum turbidity value was 11.4, and the precipitable water content was 10 cm. The daily mean global radiation during the spring was 690 cal/sq cm/day. Despite the arid climate, Tibesti had on the average a rather high turbidity due to the water vapor and aerosol concentration in the atmosphere. The aerosols also reduced the radiation in the near infrared region.

30290 **APTIC NO. 52304**

Toth, R. A., C. B. Farmer, R. A. Schindler, O. F. Raper, and P. W. Schaper

DETECTION OF NITRIC OXIDE IN THE LOWER ATMOSPHERE. *Nature Phys. Sci., 244(131):7-8, July 2, 1973. 9 refs.*

The results of spectroscopic measurements made in the lower stratosphere, in which absorptions due to nitric oxide have been identified are described. The three spectra chosen were obtained on the morning of March 11, 1973, near Albuquerque, New Mexico. The aircraft altitude was 11.95 km and the height of the tropopause was 10 km. The signal to noise ratio of each of the spectra was greater than 300 to 1.

30291 **APTIC NO. 52157**

Toyoshima, Kazuo

AIR POLLUTION IN AICHI PREFECTURE - THE PRESENT AND THE FUTURE TREND OF SULFUR OXIDES. *(Aichi-ken no taiki osen--io sankabutsu no genkyo to keiko). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(1):9-17, Jan. 1973. 6 refs.*

The seasonal patterns of air pollution in Aichi Prefecture were studied by analyzing sulfur dioxide measurements taken by the lead dioxide method. Some of the characteristics were as follows: localized SO2 concentration patterns showed very regular seasonal cycles, and very high correlations were recognized between summer and winter patterns. Therefore, predictions are possible for summer from winter records, or vice versa. The large atmospheric mass surrounding the most polluted area of the Prefecture existed in the Nagoya area, and it moved along with seasonal winds. The movement and dispersion in summer were weak. In winter, these localized masses seemed to form even greater masses. This observation requires more study. The fuel oil consumption in 1971 increased by 14% over that of 1970, but SO2 concentration clearly decreased in 1971. While the decrease is clear and significantly great in centers of cities, the peripheral areas showed only a slow decrease or a plateau.

30292 **APTIC NO. 52161**

Varkonyi, Tibor

ATMOSPHERIC POLLUTION AND PURIFICATION PROCESS. *(A legkor szennyezodesenek es tisztulasanak* *folyamatai). Text in Hungarian. Energia Atomtech. (Budapest), 26(3):132o139, 1973. 34 refs.*

Atmospheric pollution and purification processes are discussed. Anthropogenic air pollution is due mostly to combustion processes in households, industry, and transportation. The contribution by households and industry to global air pollution are decreasing or stagnating, and that by traffic is rising due to the implementation of air pollution control measures in industry, and the increased use of remote heating and of oil, gas, and electricity in households against a background of ever-increasing traffic density. Pollutants present in the atmosphere are eliminated from it by settling, impaction, precipitation, absorption, adsorption, rainout, washout, and fallout. Heat, light, ultraviolet and radioactive radiation, as well as metal ions, assuming the role of catalysts, can produce reactions of air pollutants such as oxidation, reduction, photochemical reactions, thermal reactions, hygric reactions, hydration, ionization, or phase change in the atmosphere. Atmospheric dilution is due to winds and vertical movement of air masses. Turbulent winds have high dilution efficiency, while laminar winds may inhibit the dilution process.

30293 **APTIC NO. 51958**

Walter, H.

COAGULATION AND SIZE DISTRIBUTION OF CONDENSATION AEROSOLS. *Aerosol Sci., 4(1):1-15, Jan. 1973. 26 refs.*

A coagulation equation was set up and a numerical solution was proposed for calculating the changes with time of concentration and size distribution of condensation aerosols which are formed in the atmosphere, or in the laboratory, but the continuous production of primary particles, either by spontaneous condensation or gas reactions. The size range of condensation aerosols its value is strongly dependent on the gas kinetic correction of FUCHS. The form of this correction is discussed. Using the equation, the change of concentration with time is calculated when there is a constant rate of production of primary particles of uniform size. Good agreement with measurements is obtained, bearing in mind the lower limit of detection of the condensation nucleus counter which was employed. The change with time of the corresponding distribution of particle size of the condensation aerosol is examined and the large influence upon it of previously existing large particles is shown. Size spectra measured in the atmosphere, over the range of condensation aerosols, suggest that the part played by homogeneous gas reactions in their formation is important in comparison with ion-molecular reactions, on the grounds of the very different particle sizes. The model is extended to include the production of particles of two different sizes. (Author abstract modified)

30294 **APTIC NO. 52520**

Weickmann, H. K. and R. F. Pueschel

ATMOSPHERIC AEROSOLS: RESIDENCE TIMES, RETAINMENT FACTOR AND CLIMATIC EFFECTS. *Beitr. Physik Atmosphaere, 46(2):112-118, 1973. 32 refs.*

A retainment factor (R) for atmospheric aerosols has been defined as the fraction of the annually produced aerosol mass which is retained by the atmosphere. Its application to various aerosol systems leads to the following conclusions: A range for R between .00001 and 1.0 exists. Consequently, different aerosol systems affect climate to different degrees depending on their physical-chemical properties and their injection level within the atmosphere. Also, 11.5% of the total aerosol burden is anthropogenic. It is produced, however, on only 2.5% of the earth's surface leading to numerous cases of inadvertent weather modification. From a combination of annual production rates, retainment factors and a climatic model proposed by Barrett, it follows that man is responsible for a global temperature change of about 0.1 C below that for a clear atmosphere. This is less than the contribution of each of various natural aerosol systems such as sea-salt, soil dust, and the volatile portion of the natural aerosol. From presently existing energy requirements it is estimated that in about 23 years man will be compatible with nature in aerosol production. By improved emission control techniques, however, it should be possible to control aerosol production and to avoid man-made global climatic consequences. (Author abstract)

30295 **APTIC NO. 51959**

Winchester, John W.

TRACE METAL APPLICATIONS IN URBAN AIRBORNE PARTICULATES. *Bull. Am. Meteorol. Soc., 54(2):94-97, Feb. 1973. 17 refs. (Presented at American Meteorological Society, Conference on Urban Environment, Philadelphia, Pa., Nov. 1, 1972.)*

Several sampling and analysis schemes and auxiliary studies, carried out within and remote from the Chicago area, are reviewed and evaluated for their possible inclusion into larger national air monitoring programs. An approximate elemental emissions inventory for the urban region was calculated from available published information and was used to account for contributions from major pollution sources. A multi-station study of urban and non-urban near surface air led to discovery of certain elemental correlations useful in distinguishing pollution from regional background and in tracing long distance transport of pollutants. Particle size distributions gave insights concerning types of processes at pollution sources and identification of unsuspected sources. Diurnal variations suggested meteorological factors which may regulate concentrations in air. Auxiliary laboratory studies can confirm mechanisms for alteration of aerosol composition by chemical reactions in the atmosphere. For certain elements, such as some non-metals and semi-metals, anomalous natural sources at the sea or land surface must be further documented before long distance transport from localized pollution sources can be quantified. (Author abstract modified)

30296 **APTIC NO. 52451**

Zimmermann, M.

AIR HYGIENE AND METEOROLOGY. BEGINNINGS OF A HOLISTIC CONSIDERATION OF AIR POLLUTION PROBLEMS IN URBAN CENTERS. *(Lufthygiene und Meteorologie. Ansaetze zur gesamtheitlichen Betrachtung der Luftverschmutzungsprobleme in einem staedtischen Ballungsgebiet). Text in German. Gesundheitstech., 7(5):86-88, 1973.*

Every air pollution problem must be seen as a logical sequence of three processes, emission of pollutants, dispersion of the pollutants, and grand level emissions. The practical approach to this way of dealing with air pollution is explained. Sulfur dioxide is used as an example. This pollutant develops during the combustion of sulfur-containing mineral oil products and is emitted from industrial stacks and by home heaters. For determination of the emission of this pollutant, an emission inventory must be established, which indicates where and which amounts of SO2 are emitted into the lower atmosphere. Two types of pollution sources are distinguished, point and area sources. Point sources must be measured individually. The emission by area sources can be calculated from the fuel consumption. The pollutant dispersion is calculated by means of the familiar dispersion calculation for which meteorological conditions must be known. This includes knowledge of vertical temperature distribution, wind velocity, wind direction, and turbulence. From the emission data and the meteorological data, the ground level concentration can be calculated. For those cases in which various weather and emission situations must be correlated for many sources, the computer is indispensable.

1972

30297 **APTIC NO. 51935**

Aleksandrov, E. L. and A. F. Kovalev

THE INFLUENCE OF RELATIVE HUMIDITY ON THE LIGHT SCATTERING COEFFICIENT IN THE ATMOSPHERE. *(O vliyanii otnositelnoy vlazhosti vozdukha na koeffitsient rasseyaniya sveta v atmosfere). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):124-127, 1972. 5 refs.*

The relative humidity and the light scattering were measured simultaneously at an altitude of 300 m to determine possible correlations between relative humidity and light scattering coefficients. The measurements of the light scattering coefficient were performed by means of a nephelometer in a period of atmospheric stability from 11:30 pm, Oct. 21 through 6.15 am, Oct. 22, 1970. The measured relative humidity was in a range of 91-99%, and scattering coefficients ranging from 0.00017 to 0.00035/m were determined. Fairly good correlation between the coherent values of relative humidity and light scattering coefficient was obtained. Simultaneous measurements of relative humidity and light scattering coefficients permit evaluation of the mass concentration of aerosol particles, and of the quantity of water-soluble substance in atmospheric aerosol particles.

30298 **APTIC NO. 52477**

Allee, Paul A., Bradley T. Patten, and Earl W. Barrett

THE DYNAMIC CALIBRATION OF AN AIRBORNE ICE NUCLEI GENERATOR. *J. Rech. Atmospheriques, 6(1, 2, 3):29-40, Jan.-Sept. 1972. 6 refs.*

Airborne ice nuclei generators are calibrated on the ground by introducing a portion of the generated smoke into a chamber containing a supercooled water cloud at a known temperature and counting the number of ice crystals thus produced. The applicability of such a calibration is subject to the criticism that actual in-flight conditions, such as air temperature, pressure, aircraft velocity, and operational attitude, are not simulated during calibration. It was necessary to make confirmatory measurements of generator output under flight conditions since agreement between such measurements and ground based calibrations would increase confidence in the latter. Two techniques to measure the in-flight output of an airborne ice nuclei generator are described. In one method the aircraft flew in clear air, generated an ice nuclei plume, then made a turn to intersect the plume at a right angle. Measurements of the ice nuclei and Aitken nuclei concentrations were made, and assuming the distribution of nuclei concentrations along the flight path intersecting the axis of the plume to be Gaussian, the output of the ice nuclei generator was computed. In the second method the airborne generator was used to seed a supercooled stratus cloud and the seeded plume which developed was photographed from another aircraft above the cloud. Theoretical considerations and measurements of the ice crystal concentration under a seeded portion of the stratus cloud indicated that crystal concentrations less than 100/l limit lateral spreading of a seeded plume. The maximum seeded volume of the stratus cloud was measured, and allowing one ice nucleus per crystal the total number of ice nuclei was computed to determine the output of the airborne ice nuclei generator for two types of silver iodide solutions utilized. The efficiency of dry ice used as an ice nuclei seeding agent was measured in the same manner. (Author abstract)

30299 **APTIC NO. 52035**

Berlyand, M. Ye., I. I. Solomatina, and L. R. Sonkin

ON AIR POLLUTION FORECASTING. *(O prognozirovanii zagryazneniya vozdukha). Text in Russian. Meteorol. i Gidrol., no. 9:11-18, 1972. 16 refs.*

Principles of forecasting dangerous air pollution situations are discussed, and the value of air pollution forecasting is demonstrated by examples from industrial areas in the USSR. Based on theoretical investigations of atmospheric conditions, meteorological conditions under which high pollutant levels in the surface layer can develop are determined. The seriousness of hazardous meteorological conditions is influenced by the nature and altitude of emission sources. Unstable atmospheric stratification is most dangerous in the case of high-altitude emission sources. Combinations of ground-layer inversion with calm is most dangerous in areas with low emission sources where the impact of high sources is negligible. In general, low inversions, the retention layer immediately over the emission sources, and calm below the emission source with superadiabatic temperature gradient are among the most hazardous meteorological conditions with respect to the development of high ground-layer pollutant levels. Adequate siting of new industrial plants with respect to prevailing meteorological conditions, and operative pollution forecast for the initiation of special emission control measures in critical situations are effective means of abating ground-layer pollutant concentrations.

30300 **APTIC NO. 51902**

Bhumralkar, Chandrakant Madhao

AN OBSERVATIONAL AND THEORETICAL STUDY OF ATMOSPHERIC FLOW OVER A HEATED ISLAND. *Miami Univ., Fla., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972, 133p. 32 refs.*

A numerical model was constructed to study atmospheric flow over a heat island and the effects on the atmosphere of changes in wind, humidity, cloudiness, rainfall, and the distribution of pollutants. The model was tested by application to actual meteorological data from an island and closely corresponded with respect to predictions of alterations in the airflow structure and cloud and rain distributions. With a few modifications, the model could also be applied to predict quantitatively the dispersion of air pollution by mesoscale circulations.

30301 **APTIC NO. 52388**

Brutsaert, Wilfried

RADIATION, EVAPORATION AND THE MAINTENANCE OF TURBULENCE UNDER STABLE CONDITIONS IN THE LOWER ATMOSPHERE. *Boundary-Layer Meteorol., 2:309-325, March 1972. 51 refs.*

An expression is derived relating the critical flux Richardson number with the critical (gradient) Richardson number. In contrast to an earlier analysis by Townsend which is restricted to the atmosphere well outside the earth's boundary layer, the present treatment is intended specifically for turbulent flow in the lower atmosphere and it takes account of the effect of evaporation on the stability. The effect of radiation on the rate of destruction of the mean square of the temperature fluctuations is obtained by considering the radiative flux divergence in a stratified atmosphere and by using a simple functional relationship to represent empirical emissivity data. Evaporation and radiation increase the critical Richardson number by a sensible amount depending on the atmospheric conditions, mainly temperature, humidity, and the gradients. There is no definite critical Richardson number but rather a range between 0.25, below which turbulence is very likely, and somewhat higher than 0.5, above which turbulence is improbable. The value of the critical Richardson number can be expressed in terms of evaporation, radiation, and the ratio sigma m/upsilon asterisk. Evaporation and radiation cause the ratio sigma m/upsilon asterisk to be larger than unity under neutral conditions. These results, based on the assumption of Reynolds analogy, are consistent with the available experimental evidence. (Author abstract modified)

30302 **APTIC NO. 52403**

Buell, C. Eugene

CORRELATION FUNCTIONS FOR WIND AND GEOPOTENTIAL ON ISOBARIC SURFACES. *J. Appl. Meteorol., 11(1):51-59, Feb. 1972. 15 refs.*

The fact that the geostrophic wind equations describe a large fraction of the relation between wind and geopotential and that the atmosphere approximates horizontal homogeneity and is nearly isotropic leads to two differential equations relating the correlation coefficients for geopotential with those for longitudinal and transverse wind components. Consequently, empirical formulas for any one of these correlation coefficients cannot be reasonably considered without reference to both the others. A family of three such related correlation coefficients must simultaneously fit observed correlations for all three quantities concerned. Several such self-consistent sets of correlation coefficients are compared with the data. (Author abstract)

30303 **APTIC NO. 52002**

Bultynck, H. and L. M. Malet

EVALUATION OF ATMOSPHERIC DILUTION FACTORS FOR EFFLUENTS DIFFUSED FROM AN ELEVATED CONTINUOUS POINT SOURCE. *Tellus (Uppsala), 24(5):455-472, 1972. 17 refs.*

Using the wind vector fluctuations measured at a height of 69 m by a tridimensional anemometer, the standard deviations sigma y and sigma z of the lateral and vertical distributions of the effluents emitted by an elevated continuous point source were computed. Nearly 300 hourly tests covering most of the weather conditions to be encountered on the Mol site were made, during which the values of a stability parameter S, defined as the ratio of the hourly mean of the vertical gradient of the potential temperature between 8 and 114 m to the square of the hourly mean wind speed at 69 m was measured. The dependence functions sigma y and sigma z were of the hyperbolic type for S greater and less than zero. They applied for hourly mean wind speeds up to 11.5 m/sec. For the sake of simplicity and quick estimations of sigma y and sigma z for current practical uses, seven atmospheric stability classes were defined with the corresponding median sigma y and sigma z values at different downwind distances x. The Mol theoretical results compare favorably with those found by means of field experiments carried out on the Mol site and elsewhere. (Author abstract modified)

30304 **APTIC NO. 52023**

Filippov, V. L. and S. O. Mirumyants

AEROSOL EXTINCTION OF VISIBLE AND INFRARED RADIATION AS A FUNCTION OF AIR HUMIDITY. *Bull. Acad. Sci. USSR, Phys. Atmos. Oceans. (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 8(9):571-574, Sept. 1972. 25 refs.*

Extensive measurements of the dependence of the aerosol extinction coefficient on the relative humidity were made in the visible and infrared regions. There is a pronounced trend toward lower visibilities as the relative humidity of the atmosphere increases. The closest correlation between the variation of visibility and humidity is observed immediately after heavy precipitation and in periods with alternating clear weather and light haze. In a given weather situation, the relationship between visibility and humidity can be quantified; the relationship varies with the type of haze considered, however. Experimentally determined relationships are presented graphically for several different types of haze.

30305 **APTIC NO. 52056**

Ingelstam, Lars

SYSTEMS STRUCTURE AND FUTURE TRENDS IN A LONG TERM ENVIRONMENTAL STUDY. *J. Syst. Eng., 3(1):3-18, Summer 1972. 19 refs.*

General systems theory is applied to the problem of the relationship between sulfur dioxide emissions and acid precipitation. Two successive stages in the analysis (logical model and systems model) are distinguished. This is a helpful procedure in similar cases dealing with complex systems containing components of very diverse kinds. The system components and their relationships are described in detail, down to their operational use. The use of the model thus constructed for decision-making is discussed; the model does not refer to a very precise decision-making situation. Hence the systems and policy analyses can only be performed on a general level. Techniques for describing future developments are presented in detail. The usefulness of a traditional cost-benefit analysis in this case is discussed briefly; a reasonable multi dimensional description best serves the purpose to support decisions. The inclusion of an interest analysis, which goes directly into the question of what groups and segments in society are affected and in what way, is suggested as a reasonable target in studies of this kind. (Author summary modified)

303[illegible] **APTIC NO. 51970**

Karol, I. L. and L. T. Myatch

CONTRIBUTION OF THE PLANNING OF THE STATION NETWORK FOR MEASURING THE CHEMICAL COMPOSITION OF PRECIPITATION. *Tellus (Uppsala), 24(5):421-427, 1972. 15 refs.*

The data on the chemical composition of precipitation obtained during the period from 1958 through 1965 at 28 stations situated on the European Territory of the USSR are used to calculate correlation functions of calcium, sodium, and sulfate ion and ion sum concentrations in precipitation and deposition. Correlation distances for various ions are in the range of 90 to 450 km. The mean square random errors in ion composition measurements (35-45%) are estimated using calculated correlation functions. The mean station separation of about 100 km gives the error of optimum interpolation to the point for the total ion concentration in precipitation equal to the random error of observations. The optimum averaging of the deposition value over some area can give the same error, 2-3 stations inside 300 by 300 sq km. (Author abstract modified)

30307 **APTIC NO. 52293**

Laitinen, H. A.

IMPACT OF LEADED GASOLINE ON MAN S ENVIRONMENT. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 27p., 1972. 12 refs. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

An interdisciplinary research project on the environmental effects of lead pollution is discussed. Laboratory studies are being carried out by plant effects, animals effects, and soil water-air-plant continuum teams. The field studies are centered around an ecosystem comprising an 86 sq mi watershed area, with urban and rural components, north of Champaign Urbana. The ecosystem group is conducting systematic sampling of plant and animal species, soils, water, and sediments. The results are being used to test a mathematical model describing the distribution of lead throughout the watershed. Preliminary results indicate that lead concentrations are highest, and the effects least well characterized, in three areas: urban areas, strips of land 50 m on each side of high traffic density roads, and the suspended matter and sediments of natural drainage and sewage systems. Ninety percent of the area receives only a small fraction of lead. Except for crops and animals in high concentration areas, the agricultural effects appear to be negligible. Problems under continuing investigation are protective mechanisms in waters, soils, plants, and animals, the best technique for tracing lead from source to accumulation point, the long-term versus short term binding effects of lead, the intermediate organizational level effects of lead introduced through different paths, methods for predicting changes in lead distribution, the combined effects of two or more trace metals; and the societal consequences of pollutants and measures for their abatement. Lead emitted by automobiles using leaded gasoline is one of the most important lead sources.

30308 **APTIC NO. 52486**

Langer, G. and Joachim Weickmann

A COMPARISON OF VARIOUS TECHNIQUES TO COUNT AGI NUCLEI WITH EMPHASIS ON THE MEMBRANE TECHNIQUE. *J. Rech. Atmospheriques, 6(1-3):335-342, Jan.-Sept. 1972. 6 refs.*

Silver iodide particles were classified as to size with a cascade impactor using as a substrate glass cover slips treated with silicone resin. The cover slips were developed using the membrane technique. In the range from 0.3 to 3.0 micron AgI powder particles were nucleated 100% by contact at minus 21 C and only 10% by condensation. At minus 8 C, nucleation efficiency was 3% for both processes. In the above size range, nucleation efficiency was independent of size. On a membrane filter substrate, the counts were a factor of 10 lower than above. This seemed to be due to penetration of particles into the filter. If the particles were allowed just to settle on the membrane, this loss did not take place. The membrane technique was also compared to the NCAR Counter and an expansion chamber. The NCAR Counter and the expansion chamber also detected all the particles as ice nuclei at minus 21 deg C. The expansion chamber became less efficient at the higher temperatures because of the weaker cloud that is formed at the lower expansion ratios. Instrumentation and test procedure are described in detail. (Author abstract)

30309 **APTIC NO. 52383**

Levy, Hiram, II

PHOTOCHEMISTRY OF THE LOWER TROPOSPHERE. *Planetary Space Sci., 20(6):919-925, June 1972. 56 refs.*

A steady state model of the chemistry in the lower atmosphere is developed in which the number densities of major atmospheric species, nitrogen, ozone, water, methane, carbon monoxide, nitrous oxide, ammonia, nitric oxide, and nitrogen dioxide are held constant at values appropriate to a summer latitude of 34 deg. Hourly daytime concentrations are then calculated for hydrogen peroxyl radical (HO2), hydroxyl radical (OH), methylperoxyl radical (CH3O2), methoxy radical (CH3O), formaldehyde, NO, NO2, nitrate, nitric anhydride (N2O5), nitric acid, and nitrous acid along with a representative evening value. The major products of the nitrogen daytime chemistry are HNO3 and HNO2. The apparent controlling loss mechanism for HNO3, heterogeneous reaction of HNO3 on particulate surfaces leading to the formation of inorganic nitrates, is also an important mechanism for removing nitrogen oxides from air. The calculated removal rate greatly exceeds the estimates of Erickson (1952), though some critical rate coefficients are in doubt and the effect of bacterial action was not considered. The dominant radicals, HO2 and CH3O2, have daytime concentrations approaching 1.2 times 10 to the 9th power molecules/cu cm and 5 times 10 to the 8th power molecules/cu cm, respectively. The hydroxyl radical concentration approaches 1.7 times 10 to the 7th power moles/cu cm. At night HO2 and CH3O2 are the only radical species present in a significant amount. Chain reactions which interconvert HO3 and OH also serve as a source of formaldehyde and a sink for CO, H2, and CH4. The CH4 sink ultimately results in the production of CO and H2, thus providing a large natural source for both. (Author abstract modified)

30310 **APTIC NO. 52015**

Liu, Hsien Ta

MASS DIFFUSION OVER WIND WAVES. *Colorado State Univ., Fort Collins, Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., April 1972, 161p. 77 refs.*

The mass diffusion process over a water surface from an elevated point source was investigated experimentally and numerically. To obtain experimental data on fluctuating particle concentration, an optical device was developed with a frequency response and sampling volume similar to a hot-wire anemometer. A steady stream of aerosol particles was generated by atomization of a heavy oil. Velocity measurements indicated that normalized mean velocity and relative turbulent intensities were distributed similarly for low over wind waves for free stream velocity equal to 10 ft/sec and over a flat plate for freestream velocity equal to 10 and 20 ft/sec. Comparison of normalized mean velocity distributions indicated that net momentum was transferred from the air steam to water waves, and the amount transferred was proportional to the wind speed. However, there was less net momentum transfer from the air stream to mechanically generated water waves. The relative turbulent intensities increased with increasing speed over wind waves. Comparatively large vertical gradients of relative turbulent intensities characterized flow over mechanical waves. Concentration measurements indicated that the diffusion process is directly proportional to turbulent intensities. The influences of turbulent diffusion, wind shear, and surface reflection shifted the maximum mean concentration toward the lower boundary, while the turbulent diffusion shifted the maximum root-mean square concentration upward and laterally. The mean concentration distributions over wind waves for free stream velocity equal to 10 ft/sec were similar to those over a flat plate for freestream velocity equal to 20 ft/sec. A revised diffusivity model is proposed. With this model, which incorporates local conditions by introducing dependency on boundry layer thickness, general agreement was observed between numerical solutions and the corresponding experimental data. (Author abstract modified)

30311 **APTIC NO. 52381**

Maddox, John

POLLUTION AND WORLDWIDE CATASTROPHE. *Nature (London), 236(5348):433-436, April 28, 1972. 13 refs.*

Problems associated with the presence of persistant organochlorine pesticides in the environment are reviewed. The only demonstrable effect in man of exposure to environmental levels of DDT is accumulation in fatty tissues. For predominant groups in the U. S. population, the mean DDT concentration in fatty tissue is 4.17 ppm and the median concentration is 3.32 ppm. The concentrations are higher in males than females and appear to increase with age. The present dietary intake of DDT is insufficient to cause interaction resulting from enzyme induction, nor has the carcinogenic potential of DDT been demonstrated. The potentially more serious consequence of widespread use of DDT is the way in which residues accumulating in birds can affect species survival by reducing the thickness of eggshells and thus the viability of newborn chicks. Brown pelicans off the coast of North America have been afflicted by reduced hatching rates. However, if the oceans are not effective as a means of spreading DDT throughout the ecosystem and in particular of contaminating important food chains at their base, damage to sea birds will be confined to regions where persistent pesticides are used intensively. Pessimistic calculations of the climatic consequences of increased atmospheric carbon monoxide ignore a feedback mechanism which may imply that surface temperatures are insensitive to the CO concentration in the atmosphere.

30312 **APTIC NO. 52449**

Magono, Choji

A WARM FOG DISSIPATION EXPERIMENT UTILIZING BURNING PROPANE GAS. *J. Rech. Atmospheriques, 6(1-3):343-365, Jan.-Sept. 1972. 14 refs.*

Warm fog artificial dispersion experiments were made by burning propane gas at a former landing strip of an airport in Hokkaido, Japan. The experiments were made for an advection sea fog extending from the Pacific Ocean. One hundred burners were ignited simultaneously by conventional car plugs and ignition coils. In addition to the usual surface observation, a captive balloon was used to measure the vertical distribution of temperature and humidity of the air layers lower than 100 m above the ground surface, and to measure oblique visibility. Air temperature of the fog near the surface ranged from 12-15 deg C and the air was saturated during the fog. Wind speed was 0-3 m/sec and the wind direction was nearly parallel to the runway. During the experiments air temperature was raised by about 0.5 deg C by the burning of the propane gas. Relative humidity decreased by several percent, but at times no decrease was seen. The maximum diameter of fog droplets decreased from 45 micron to 35 micron, and the number density of fog droplets dropped to a half of the original count during the burning experiments. Horizontal visibility improved to twice the original visibility, specifically from 100-400 m to 250-800 m by the experiments. It was noted that the burning experiments were most effective when wind direction was parallel to the runway -- theoretical computations were in agreement. It was suggested that the propane gas method to disperse warm fog was applicable to practical use. Cost was considered. (Author abstract modified)

30313 **APTIC NO. 52431**

Martynova, V. I., A. Ye. Mikirov, and P. V. Pakhomov

ANLAYTICAL REPRESENTATION OF THE COEFFICIENT OF POLYDISPERSE AEROSOL SCATTERING ASSUMING AN EXPONENTIAL DISTRIBUTION. *Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad, Nauk, SSSR, Fiz. Atmosfery i Okeana), 8(11):712-714, Nov. 1972. 9 refs.*

General analytical expressions for the scattering coefficient of polydisperse aerosols, assuming an exponential distribution, are examined. The solution is in a converging series and is convenient for practical use. A finite particle spectrum, modified to permit separate continuation of the Junge distribution into the ranges of small and infinitely large particles, was analyzed. The major parameters included wavelength of the incident radiation, refractive index, and particle distribution function.

30314 **APTIC NO. 51850**

Misaki, Masao, Miwako Ikegami, and Izuo Kanazawa

ATMOSPHERIC ELECTRICAL CONDUCTIVITY MEASUREMENT IN THE PACIFIC OCEAN, EXPLORING THE BACKGROUND LEVEL OF GLOBAL POLLUTION. *J. Meteorol. Soc. Japan, 50(5):497-500, Oct. 1972. 6 refs.*

In the summer of 1971, measurements of atmospheric electrical conductivity in the Pacific Ocean were made during a cruise from Tokyo Bay to Marcus Island via the Ogasawara Islands. One Gerdien conductivity apparatus was installed on the starboard side of the ship and another on the port side. Conductivity on the lee side was always smaller than on the windward side, the percentage difference on the lee side varied sinusoidally with relative wind direction. Conductivity increased south of Tokyo Bay and, based on values obtained with the windward apparatus, and remained fairly stable south of latitude 30 deg N The average mean value of 2.54 by 10-14 ohm/m indicates that pollution in this area of the Pacific is still at a low level compared with that in the North Atlantic.

30315 **APTIC NO. 52434**

Neiburger, Morris, Zev Levin, and Lawrence Rodriguez, Jr.

EXPERIMENTAL DETERMINATION OF THE COLLECTION EFFICIENCY OF CLOUD DROPS. *J. Rech. Atmospheriques, 6(1-3):391-397, Jan.-Sept. 1972. 12 refs.*

The collection efficiencies of cloud drops up to 120 micron in radius under conditions resembling those in natural clouds were determined using the UCLA cloud tunnel. The experimental method is described. The observed collection efficiencies were compared to theoretical collision efficiencies, and these were not in agreement. The difference in efficiencies was due to the coalescence efficiency being very small for those drops in natural conditions. (Author abstract)

30316 **APTIC NO. 51849**

Okita, Toshiichi

CALCULATION OF RATE OF ABSORPTION OF SULFUR DIOXIDE BY RAIN- AND CLOUD-DROPLETS. *Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 21(1):9-13, March 1972. 24 refs.*

The absorption rates of 0.02, 0.1, and 0.5 ppm sulfur dioxide by rain and cloud droplets were calculated using Henry s constants, dissociation constants, and diffusion coefficients of SO2 in water. Raindrop size distribution and internal circulation in the droplets were also modeled. The results show that with a rainfall rate of 1 and 10 nm/hr, the half life of SO2 is 3.1-16.1 and 0.44-2.3 hr, respectively, depending on atmospheric SO2 concentration. The resulting pH of rain and cloud water is 4.0-4.9, depending on rainfall rate and SO2 concentration. (Author abstract modified)

30317 **APTIC NO. 52483**

Ono, A.

EVIDENCE ON THE NATURE OF ICE CRYSTAL MULTIPLICATION PROCESSES IN NATURAL COLD. *J. Rech. Atmospheriques, 6(1-3):399-408, Jan.-Sept. 1972. 15 refs.*

Cloud particles were sampled at a ground station immersed in snow clouds in an investigation of the conditions relevant to crystal multiplication. The nature of cloud particles was carefully examined with a view to detecting any secondary ice crystals produced in the clouds. In some instances, high concentrations of small regular ice crystals were observed. These were 3 or 4 orders of magnitude higher than those of ice nuclei activated at the temperature of the sampling site. From their dimensions and crystal habit, it was concluded that the small regular ice crystals were recently formed near the ground by crystal multiplication. Observations showed that the production of the secondary ice crystals was primarily related to the type of ice particles present in the clouds and suggested that the formation of graupel-like rimed ice particles was responsible for the enhancement of the number of ice crystals in natural clouds. (Author abstract)

30318 **APTIC NO. 52389**

Panchev, S. and V. Andreev

NON-ADIABATIC THERMAL CONVECTION IN MOIST AIR AS A CLOUD-FORMATION PROCESS: ONE-DIMENSIONAL MODEL. *J. Atmospheric Sci., 29(1):203-206, Jan. 1972. 9 refs.*

A semi-empirical one-dimensional model for non-adiabatic thermal convection in moist air is studied. The fundamental equations to be solved are those of the heat flux moisture balance and the motion of rising air parcels (thermals) with variable mass due to mixing with environmental air. A simple solution is found and a number of characteristics levels of the convection are determined for the case of a linear decrease of the environmental temperature and specific humidity with height. The predictions of the model are quite realistic and could be used in studying the initial stage of the formation of the cumulus clouds. (Author abstract modified)

30319 **APTIC NO. 52482**

Podzimek, J.

THE LABORATORY STUDY OF THE FREEZING OF SUPERCOOLED FOG DROPLETS. *J. Rech. Atmospheriques, 6(1-3):419-438, Jan.-Sept. 1972. 46 refs.*

A laboratory study of the freezing of supercooled fog droplets is described. The pilot experiment with ice crystal generation via collision of supercooled water drops in an acoustic field or during the fall of larger drops showed negligible influence of acoustic standing waves and a higher tendency of fog droplet freezing behind larger falling drops. At about minus 13 C there was the highest probability of ice crystal generation from the entire range to temperatures investigated minus 3 C to minus 20 C, and the ice crystals had irregular shapes revealing their growth in two parallel levels, one above the other. Experimental methodology, goals, and theoretical background are discussed along with the results of the experiment. (Author abstract modified)

30320 **APTIC NO. 52429**

Pueschel, R. F. and B. G. Mendonca

DISPERSION INTO THE HIGHER ATMOSPHERE OF EFFLUENTS DURING AN ERUPTION OF KILAUEA VOLCANO. *J. Rech. Atmospheriques, 6(1-3):439-446, Jan.-Sept. 1972. 11 refs.*

The dispersion of effluents into the higher atmosphere during an eruption of a volcano was studied. A brief but significant eruption on Aug. 14, 1971 at Kilauea Volcano, Hawaii, ejected volcanic effluents aloft. The plume reached an estimated height of 3 km. Measurements at Mauna Loa Observatory at a 35 km distance and a 3.4 km elevation showed high aerosol concentration and low visibilities during the period of active fountaining. The energy released during this time resulting from radiation, sensible heat transfer, momentum transfer, and latent heat of condensation was intense enough to cause a break in the prevailing trade wind inversion. At the termination of fountaining, thermal radiation and heavy fuming continued at the vents for several hours and days, respectively, but the effluents were continuously unable to penetrate the temperature inversion. (Author abstract)

30321 **APTIC NO. 51969**

Rodhe, Henning and Jan Grandell

ON THE REMOVAL TIME OF AEROSOL PARTICLES FROM THE ATMOSPHERE BY PRECIPITATION SCAVENGING. *Tellus (Uppsala), 24(5):442-454, 1972. 20 refs.*

A statistical investigation is presented on the distribution of dry and precipitation periods at a Swedish station. The expected length of time from an arbitrary moment to the onset of the next precipitation period is about 90 and 35 hours for summer and winter conditions respectively. Based on the results of these investigations expressions are derived for the expected length of life of an aerosol particle in the lower layers of the troposphere. Estimates of effective precipitation scavenging coefficients give expected lengths of life of the order 100-300 hours in summer and 35-80 hours in winter. The connection between the distribution of the length of life of particles in the atmosphere and the distribution of particles on the ground away from a source is discussed, and the importance of studying such age distributions is emphasized. (Author abstract modified)

30322 **APTIC NO. 52436**

Winkler, Peter and Christian Junge

THE GROWTH OF ATMOSPHERIC AEROSOL PARTICLES AS A FUNCTION OF THE RELATIVE HUMIDITY. PART I: METHOD AND MEASUREMENTS AT DIFFERENT LOCATIONS. *J. Rech. Atmospheriques, 6(1-3):617-638, Jan.-Sept. 1972. 33 refs.*

A gravimetric method for determining the growth of atmospheric aerosol particles as a function of relative humidity was examinedha and tested in field measurements. Continental aerosols had growth curves of uniform steady curvature, and the particles absorbed considerably less water than pure salts. Three parameters were judged responsible for the smooth growth curve and the reduced water uptake as compared with single salts: the presence of insoluble material, the complex mixture of soluble material, and hydrate water. Growth studies of aerosols in central Europe determined that the giant particles, i.e., with radii greater than 1 micron, absorbed somewhat more water than the large particles, i.e., with radii smaller than 1 micron but greater than 0.1 micron. There was no significant difference between polluted and unpolluted areas. The growth curves were different during advection of maritime air masses, and the sea salt influence increased with decreasing continental influence. (Author abstract modified)

1971

30323 **APTIC NO. 51921**

Stengle, Thomas R. and James J. Lichtenberg

SAMPLING GLACIAL SNOW FOR PESTICIDE ANALYSIS. *Environmental Protection Agency, Cincinnati, Ohio, Analytical Quality Control Lab.; Massachusetts Univ., Amherst, Dept. of Chemistry; and Vermont Univ., Burlington Dept. of Community Medicine, Environmental Protection Agency, Office of Research and Monitoring Contract 16020-GAG, Proj. 16020-GAG, 30p., Feb. 1971. 2 refs.*

GPO

The feasibility of taking snow samples from high altitude snowfields for pesticide analysis was investigated, and sampling techniques which would avoid contamination were developed. Sampling was carried out in the field under adverse conditions and with minimal equipment. The DDT level was determined at the sampling site while collecting samples. Sampling was done on the plateau glacier of Mt. Logan in Canada -- an area remote from civilization. Sampling teams contended with storms, low temperatures, and the effects of high altitude. Simple techniques for obtaining samples and shipping them to the laboratory were tested. Samples were taken to a depth of 15 meters to determine whether DDT concentration varied with the age of snow. Analysis showed no DDT within the limit of detectability. Over half the samples were contaminated with PCB s (Polychlorinated biphenyls) which raised the detectability limit to 10-50 ng/l. The limit was 5 ng/l for the uncontaminated samples. The PCB contamination was believed to have come from the sampling auger, as an analysis of rinsings from it seems to confirm. It was suggested that sampling equipment be precleaned in future studies. Sampling for trace metals was more difficult, and could not be accomplished sucessfully without elaborate planning and sophisticated procedures. Sampling techniques and analytical techniques including trace metal analysis by emission spectrometry and gas chromatography were described.

1969

30324 **APTIC NO. 51904**

Reiquam, Howard Edward

CONSTRUCTION AND EVALUATION OF AN AIRSHED-EPISODE MODEL FOR AIR RESOURCE MANAGEMENT. *Oregon State Univ., Corvallis, Dept. of Biometeorology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1969, 107p. 35 refs.*

A model constructed to optimize source allocations to meet air quality standards in an airshed is examined with respect to application, spatial and time dimensions, model parameters, and evaluation. The major parameters included in model design were pollutant concentration and emission rate, episode length, advection, transport, wind direction and speed, mixing depth, temperature profiles, seasonal variation, precipitation, instability, and dispersion. The conventional configuration was designed to treat the accumulation of pollutants during episodes, while the inverse configuration provided a simple method to relate any selected air quality standard of either suspended particulate or gaseous matter to zoning criteria or emission standards. Modifications and specific applications are examined.

BASIC SCIENCE AND TECHNOLOGY

1973

30325 **APTIC NO. 52502**

Bes, Rene, Germain Lacoste, and Hassan El Khemiri

KINETICS OF THE DECOMPOSITION OF NITROGEN OXIDES IN AN ALTERNATING ELECTRICAL FIELD. *(Cinetique de decomposition des oxydes d azote dans un champ electrique alternatif). Text in French. J. Chim. Phys., 70(3):433-436, 1973. 27 refs.*

Nitrous oxide in a closed system increases its pressure through an electrical discharge 1.5 times over its initial pressure as a result of dissociation to nitrogen and oxygen. Mass spectrometric analysis performed during decomposition indicated the presence of nitric oxide, N, O, and N2O. The latter was introduced into the discharge chamber at a temperature of 33 C and an initial fixed pressure of 30 mbar. At different voltage by frequency products between 6 and 54 times 10 to the 6th power V/s, the gas sample was exposed for various lengths of time and then analyzed. Curves of variation of concentration as a function of time for the various components indicate for N2O an exponential decrease. Thus, the kinetics of N2O decomposition in an alternating electric field at low pressure point are related to the product of voltage and frequency, as in the cases of NO and nitrogen dioxide. The overall reaction results from two parallel modes of dissociation whose velocity constants are proportional to the product of voltage and frequency. Simulation of the reaction process on an analog computer confirmed the validity of the kinetic equations proposed. This reaction mechanism is compatible with the electronic diagram for N2O proposed by Zelikoff et al.

30326 **APTIC NO. 52019**

Black, Graham, Robert L. Sharpless, and Tom G. Slanger

MEASUREMENT OF VIBRATIONALLY EXCITED MOLECULES BY RAMAN SCATTERING. I. THE YIELD OF VIBRATIONALLY EXCITED NITROGEN IN THE REACTION N + NO YIELDS N2 + O. *J. Chem. Phys., 58(11):4792-4797, June 1, 1973.*

The reaction of nitrogen atoms with nitric oxide leads to vibrationally excited nitrogen. In the presence of molecular nitrogen, V-V exchange processes rapidly establish a modified distribution for which a measurement of N2(nu equals 1) is adequate to determine the total vibrational energy yield of the reaction. The measurements of N2(nu equals 1) have been made by Raman spectroscopy using the intensity of the Q branch of the anti-Stokes line at 4382 A (using 4880 A Argon(+) (laser radiation). The system sensitivity is determined using heated nitrogen. The measurements have established that 25 + or 3% of the available energy (3.27 eV) appears as vibrational energy and that the vibrationally excited nitrogen is an initial product and does not result from collisions of translationally hot oxygen atoms with nitrogen. (Author abstract modified)

30327 **APTIC NO. 52284**

Blackwood, J. D. and D. J. McCarthy

THE KINETICALLY EFFECTIVE STOICHIOMETRY OF REACTIONS IN THE CARBON-SULPHUR DIOXIDE SYSTEM. *Australian J. Chem., 26(4):723-731, April 1973. 14 refs.*

The kinetically effective stoichiometry of reactions resulting from contacting carbon and sulfur dioxide at elevated temperatures are reported. The rates of the two reactions forming carbon disulfide are shown to have similar temperature dependence in the range of 800-950 C, while the carbon-carbon dioxide reaction is shown to be more temperature sensitive than the carbon-carbonyl sulfide reaction in the same temperature range. The existence of parallel routes for CS2 formation was detected by using a mechanistic argument to remove the redundancy in the system were CS2 was concerned. (Author abstract modified)

30328 **APTIC NO. 51901**

Boffa, C. V. and E. Pfender

CONTROLLED GENERATION OF MONODISPERSE AEROSOLS IN THE SUBMICRON RANGE. *Aerosol Sci., 4(2):103-112, March 1973. 16 refs.*

A new approach is described for the generation of monodisperse ultrafine aerosols. Although numerous research-type aerosol generators have been developed or proposed for generating monodisperse aerosols in the submicron range, there is at present no reliable method available for a controlled generation of ultrafine monodisperse aerosols for a wide spectrum of materials. The proposed method ulitizes a transpiration-cooled anode operated in a high intensity arc. In this situation the aerosol is generated continuously by ablation of anode material at the steady arc attachment spot which is the hottest part of the anode surface. The transpiring gas passing through the anode provides quenching of the vapor and immediate dilution of the generated particles in the vicinity of the anode surface, in this way avoiding coagulation and formation of agglomerations. The results show that the aerosol generator described provides aerosol particles whose mean diameters can be controlled in the range from 45 A to about 1 micron with a logarithmic standard deviation mainly in the range from 1.1 to 1.2; in other words, the transpiration cooled plasma torch particle generator can produce monodisperse aerosols of controlled size anywhere in the submicron range. (Author abstract modified)

30329 **APTIC NO. 51940**

Boxall, C. R. and J. P. Simons

THE PHOTODISSOCIATION OF HNCS IN THE NEAR ULTRA-VIOLET. *J. Photochem., 1(5):363-369, May 1973. 7 refs.*

The flash photolysis of isothiocyanic acid (HNCS) was studied in the vapor phase at wavelengths greater than or approximately equal to 190 nm. The principal primary products include S(3(3)P), iminomethyl or hydrocyanic acid, hydrogen, and isothiocyanate. Imino and thiocarbonyl (CS) are not formed and S(3(1)D) atoms are formed in low yield only. The two principal primary processes in the near ultraviolet are evaluated. The photodissociation is compared with that of the isovalent molecules carbonyl sulfide and isocyanic acid where the production of S(3(1)D) or dissociation at the N-C bond are major primary processes. Reasons for the differences are discussed. The reaction of S(3(3)P) with isothiocyanic acid is very efficient with a rate coefficient greater than or approximately equal to 3 times 10 to the minus 11th power/cu cm/molecule/sec. (Author abstract modified)

30330 **APTIC NO. 52195**

Brodskiy, I. A. and A. Ye. Stanevich

STUDY OF THE SPECIFIC MOLECULAR ADSORPTION OCCURRING ON AEROSOL BY LONG-WAVE IR SPECTROSCOPY. *((Issledovaniye spetsificheskoy molekulyarnoy adsorptsii na aerosile metodom dlinnovolnovoy IK-spektroskopii). Text in Russian. Kinetika i Kataliz, 14(2):463-467, 1973. 13 refs.*

The adsorption of water, ether, acetone, acetonitrile, pyridine, and triethylamine on aerosols was studied by long-wave infrared spectroscopy in the band of 220-30/cm. Adsorption bands, corresponding to the oscillations of the adsorbed molecules relative to the surface, were observed. During the adsorption of all materials tested except water, considerable increase in transmission in the 220-50/cm-band was observed, which is due to the participation in the adsorption of aerosol surface hydroxyl groups, bound by mutual hydrogen bonds.

30331 **APTIC NO. 51761**

Calvert, Jack G., Kenneth L. Demerjian, and J. Alistair Kerr

THE EFFECT OF CARBON MONOXIDE ON THE CHEMISTRY OF PHOTOCHEMICAL SMOG SYSTEMS. *Environ. Letters, 4(4):281-295, 1973. 12 refs.*

A computer simulation of the rates of chemical changes in nitric oxide/nitrogen dioxide/carbon monoxide-containing atmospheres was extended to incorporate the effect of CO on the rate of ozone formation. The results confirmed that the presence of CO in an NO-containing atmosphere enhanced the photooxidation of NO to NO_2, and thus the formation of O_3. The model predictions were in good agreement with experimental data.

30332 **APTIC NO. 52165**

Castellano, E. and H. J. Schumacher

THE KINETICS AND MECHANISM OF PHOTOCHEMICAL OZONE BREAKDOWN AT 3340 A WAVELENGTH LIGHT. *(Die Kinetik und der Mechanismus des photochemischen Ozonzerfalles im Licht der Wellenlaenge 3340 A). Text in German. Z. Physik. Chem. Neue Folge (Frankfurt), 83(1-4):54-63, 1973. 5 refs.*

The kinetics of the photochemical ozone breakdown at 3340 A between -12.5 and +25 C was studied. The quantum yield has a maximum of 4.0 Mol/hv in an oxygen-free system, independently of the ozone concentration and of the presence of inert gases. Inhibition of the breakdown reaction by oxygen was noted. With oxygen present, the inert gases exert a specific, reaction rate-reducing effect. Under identical conditions, the reaction is identical with that observed in red light, however, the quantum yield determined at 3340 Angstrom is double that observed in red light. The ozone breakdown represents no chain reaction, and the mechanism of ozone breakdown corresponds to that observed in red light, the difference from the latter being the formation primarily O_2(delta g) molecules.

30333 **APTIC NO. 52203**

Clough, W. S.

TRANSPORT OF PARTICLES TO SURFACES. *J. Aerosol. Sci., 4(3):227- 234, 1973. 11 refs.*

The rate of deposition of particles to smooth extended surfaces and horizontal filter paper was measured in a large wind tunnel. The particles used covered the size range from 0.08 to 30 micron, and the effect of wind speed was also investigated. The results provide some confirmation of theoretical predictions for deposition rates to smooth surfaces and they have also been used to evaluate the performance of a dry deposition sampler, made from filter paper, which has been used to sample the natural aerosol. (Author abstract modified)

30334 **APTIC NO. 51769**

Cook, Robert L., Gisbert Winnewisser, and D. C. Lindsey

THE CENTRIFUGAL DISTORTION CONSTANTS OF DISULFUR MONOXIDE. *J. Mol. Spectr., 46(2):276-284, May 1973.*

To obtain an improved and more complete set of rotational parameters to use the measured distortion constants to obtain information on the fundamental vibrational frequencies, the major constituent in a microwave discharge of a mixture of sulfur dioxide and sulfur vapor was investigated. The microwave spectrum of the molecular transient disulfur monoxide was reexamined, and the microwave measurements were extended into the mm-wave region. From the data, the ground-state rotational constants and quartic distortion constants were obtained. The centrifugal distortion constants obtained from the rotational spectrum were used to discuss the vibrational spectrum of S_2O.

30335 **APTIC NO. 52058**

Dahneke, Barton E.

SLIP CORRECTION FACTORS FOR NONSPHERICAL BODIES--I INTRODUCTION AND CONTINUUM FLOW. *Aerosol Sci., 4(2):139-145, March 1973. 15 refs.*

Exact calculations of aerodynamic drag on small bodies must consider the discrete nature of the suspending gas when the Knudsen number (Kn) is sufficiently large and correspondingly correct continuum expressions for the drag. The slip correction factor is well known for the case of spheres, but not for other shapes. A method is described by which the general form of the correction factor over the full range of Kn is obtained for spheres, discs, cylinders, spheroids, and cubes. Since the method requires expressions for continuum and free molecule drag, this first paper summarizes some of the principal experimental and theoretic results for continuum flow drag. Subsequent papers describe free molecule drag and a simple approximation technique for estimating the drag for any value of Kn. (Author abstract modified)

30336 **APTIC NO. 52059**

Dahneke, Barton E.

SLIP CORRECTION FACTORS FOR NONSPHERICAL BODIES--II FREE MOLECULE FLOW. *Aerosol Sci., 4(2):147-161, March 1973. 2 refs.*

Free molecule drag on spheres moving at low velocities has long been understood. More recently, with the advent of high altitude aircraft and space flight, expressions have been obtained for free molecule drag on various bodies of special interest in aeronautics including spheres, flat plates, and cones at various angles of attack, and infinite cylinders oriented perpendicular to the flow. For a remaining class of bodies that commonly obtains free molecule flow conditions, namely small airborne particles of various shapes, expressions for free molecular drag have not yet been reported. In this paper, a general integral expression for the creeping motion free molecule drag on a general convex body is derived and specific expressions are obtained for spheres, discs, cylinders, spheroids, and cubes. The range of validity of these expressions is discussed and, in the case of spheres, verified by additional theoretical and experimental results. (Author abstract modified)

30337 **APTIC NO. 52060**

Dahneke, Barton E.

SLIP CORRECTION FACTORS FOR NONSPHERICAL BODIES--III THE FORM OF THE GENERAL LAW. *Aerosol Sci., 4(2):163-170, March 1973. 5 refs.*

A method is described for approximating the creeping motion aerodynamic drag on nonspherical bodies over the full range of Knudsen numbers (Kn). The method is based on expressions for continuum and free molecule flow and involves calculating the size of the adjusted sphere which has the same slip correction factor (C) as the nonspherical body in free molecular flow. The adjusted sphere also has the same C in continuum flow, since C is always unity for this case; thus the slip correction factor of the adjusted sphere approximates that of the nonspherical body over the full Kn range. Slip correction factors for infinite cylinders were calculated with the method and were in agreement with those derived from the Pich expression. The method is applicable to a wide variety of aerodynamic drag calculations and may also be valuable in calculations of heat and mass transfers. Aerodynamic drag data results for several nonspherical bodies in various orientations are given. (Author abstract modified)

30338 **APTIC NO. 51738**

Darlage, L. J., S. S. Block, and J. P. Weidner

THE USE OF A FLAME PHOTOMETRIC DETECTOR FOR THE ANALYSIS OF COAL SULFUR. *J. Chromatographic Sci., 11(5):272-274, May 1973. 14 refs.*

The response of a flame photometric detector to the sulfur oxides produced by the combustion of sulfur-containing coal samples in a modified oxygen-flask was investigated, and a linear sulfur mass-response relationship was obtained. The analytical procedure and the qualitative analysis are described. This method was applied to eight different coals was a simple, rapid, and reasonably quantitative procedure for the analysis of coal sulfur. The method was also utilized on a qualitative basis for detecting organo-sulfur compounds in preparative TLC separations. (Author abstract)

30339 **APTIC NO. 52473**

De Soete, G.

THE MECHANISM OF NITRIC OXIDE FORMATION FROM AMMONIA AND AMINES IN HYDROCARBON FLAMES. *(Le mecanisme de formation d oxyde azotique a partir d ammoniac et d amines dans les flammes d hydrocarbures). Text in French. Rev. Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 28(1):95-108, Jan.-Feb. 1973. 7 refs.*

Nitric oxide concentration profiles were experimentally determined in combustion products of ethylene/oxygen/argon or helium mixtures to which small amounts of ammonia or amines were added. The premixed flames were stabilized on a burner with a cooled sintered plate. Analysis of the yield of NO as a function of temperature, equivalence ratio, and amount of nitrogen present disclosed that the formation of NO was based on a mechanism characterized by two competing reactions, oxidation of the nitrogen compound to NO and transformation of the nitrogen compound into molecular nitrogen by reaction with the NO formed. Comparison of the profiles of NO, oxygen, and temperature with distance in the flame led to determination of the constants of the kinetics of the reaction mechanism. For poor mixtures, maximal transformation R was near unity. In many instances the NO content attained a much higher value than the thermodynamic equilibrium concentration at the given temperature. With the richness of the mixture climbing above the stoichiometric ratio, R decreased very rapidly. Thus R depended on the oxygen content in the mixture. One of the intermediary products was cyanhydric acid which forms very early in the reaction in non-negligible quantities, but which disappears beyond the combustion zone. The above mentioned two competing reactions were characterized by close temperature coefficient values: 30 kcal/mol for the first reaction, 27 kcal/mol for the second.

30340 **APTIC NO. 51858**

Ehrlich, Richard and Sol Miller

SURVIVAL OF AIRBORNE PASTEURELLA TULARENSIS AT DIFFERENT ATMOSPHERIC TEMPERATURES. *Appl. Microbiol., 25(3):369-372, March 1973. 9 refs.*

The aerosol survival, recovery, and death rate of the bacteria Pasteurella tularensis SCHU S5 disseminated in particle size of 1 to 5 millimicron were significantly affected by air temperature. The highest aerosol recovery of viable P. tularensis was observed within -7 and 3 C; the recovery decreased significantly below and above this temperature range. The death rate of airborne P. tularensis was not significantly influenced by an increase in temperature from -40 to 24 C. However, a progressive increase in atmospheric temperature from 24 to 35 C resulted in increased death rates; thus, a linear relationship appeared to be present between the temperature and death rates. At 49 C, the recoveries of viable airborne P. tularensis were significantly lower and the death rates were higher than at the other temperatures. (Author abstract modified)

30341 **APTIC NO. 52488**

Gaillard-Cusin, Francoise and Henri James

THE PROCESS OF CHAIN RAMIFICATION IN THE COMBUSTION OF CARBON MONOXIDE. ANALOGY WITH THE HYDROGEN-OXYGEN REACTION. *(Le processus de ramification des chaines dans la combustion de l oxyde de carbone. Analogie avec la reaction hydrogene-oxygene). Text in French. J. Chim. Phys., 70(3):507-513, March 1973. 21 refs.*

The propagation of combustion chains during combustion of carbon monoxide can be explained by postulating several energy levels for the excited carbon monoxide molecule which explains very satisfactorily the kinetics of the combustion peninsula. Reactions like that of carbon monoxide with oxygen-of of hydrogen with oxygen are characterized by low pressure combustion areas (peninsulas) where reaction chains propagate the reactions, of which at least one (in the case of CO oxidation) emits intense light. The propagation velocity factor, the chain rupture velocity factor in homogenous phase, and the chain rupture velocity factor at the surface are of different orders of magnitude in relation to the existing pressure. Positive values of the chain propagation velocity factor (net branching factor) for the CO reaction arise from the ability of the excited carbon dioxide molecule to reach a higher energetic state before being deactivated by collision. The negative pressure coefficient which is responsible for the observation of the combustion peninsula does not need a third body collision for the homogeneous chain breaking process of the mechanism. The same mechanism can be postulated for hydrogen phosphide, phosphorus, carbon disulfide, hydrogen sulfide, and carbonyl sulfide.

30342 **APTIC NO. 52044**

Gerrard, William

SIGNIFICANCE OF THE SOLUBILITY OF HYDROCARBON GASES IN LIQUIDS IN RELATION TO THE INTERMOLECULAR STRUCTURE OF LIQUIDS AND THE ESSENTIAL PATTERN OF DATA FOR ALL GASES. *J. Appl. Chem. Biotechnol., 23(1):1-17, Jan. 1973. 54 refs.*

Solubility data expressed as mole ratio X subrH (moles of RH/mole of liquid), were measured for propane and n-butane in a number of type-representative organic liquids at different temperatures and pressures less than or approximately equal to 760 mm. These data, and those for methane, ethane, and radon, are used to develop an essential pattern of data for all gases and all liquids. The pattern indicates that the first factor determining the solubility of any gas in a liquid is its tendency to condense to a liquid at the operational temperature (e.g., 0-25 C), shown by its vapor pressure over liquid gas (or its equivalent for a gas above the critical temperature) at various temperatures. Boiling point is an initial index of the first factor, which is the vapor pressure of gas over its liquid at fixed temperature. The second factor is the intermolecular structure of liquid used to absorb the gas. The third factor is the way in which the gas inevitably interacts with the liquid. These factors emerge from electron density change effects, designated as acid-base functions. (Author abstract modified)

30343 **APTIC NO. 52032**

Gubergrits, M., Lia Paalme, and Yu. Pakhapill

THE KINETICS OF THE PHOTOCHEMICAL INITIATION OF THE BREAKDOWN OF SOME METHYLATED BENZ(A)PYRENES. *(Kinetika fotoinitsirovannoy degradatsii nekotorykh metilproizvodnykh benz(a)pirena). Text in Russian. Eesti NSV Tead. Akad. Toim., Keem. Geol., 22(1):31-36, 1973. 12 refs.*

The kinetics of the photodegradation of benzo(a)pyrene, 1-methylbenzo(a)pyrene, 6-methylbenzo(a)pyrene, 1,8-dimethylbenzo(a)pyrene, 5,10-dimethylbenzo(a)pyrene, and 5,8-dimethylbenzo(a)pyrene in oxygen-containing argon atmosphere were studied to detect possible effect of methylation on the photodegradation. As evidenced by quasilinear excitation and fluorescence spectra, the substitution by methyl group of hydrogen in the benzo(a)pyrene molecule increases the reactivity of the latter under photodegradation conditions. Increase in the reactivity of the benzo(a)pyrene molecule with the degree of methylation was determined. The increase in the reactivity was dependent on the arrangement of the methyl group in the molecule, and was in linear correlation with the decrease in the energy of the first excited singlet state of the molecule.

30344 **APTIC NO. 51854**

Hashida, Isao and Masato Nishimura

ADSORPTION OF SULFUR DIOXIDE ON POLY(VINYLPYRIDINE) RESINS WITH POROUS STRUCTURE. *(Takosei biniru pirijin jushi ni yoru nisanka io no kyuchaku). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 6:1195-1200, June 1973. 18 refs.*

Various macroreticular type resins were prepared by suspension copolymerization of vinyl pyridine derivatives with divinyl benzene in the presence of iso-octane as diluent. The adsorption capacities of the resins varied greatly with the nature of the vinyl pyridine monomer species. Poly(4-vinylpyridine) had the highest adsorption capacity followed by poly(2-methyl-4- vinylpyridine); poly(2-vinylpyridine) and poly(5-ethyl-2-vinylpyridine) were approximately equal in adsorption ability. Variations in resin pore structure had little effect on adsorption capacity. Adsorption on porous resins was generally represented by the BET type adsorption isotherm; the heats of adsorption, calculated as 10-14.5 kcal/mol by use of the Clausius-Clapeyron equation, were larger than for a styrene-divinyl benzene copolymer, Amberlite XAD-2. Adsorption on the gel type resin was expressed by a Henry type adsorption isotherm. This fact indicates that sulfur dioxide is absorbed into the resin matrix and subsequently reacts with functional groups. The infrared spectrum of poly(4-vinylpyridine) film exposed to SO2 gas had characteristic bands caused by SO2 pyridine molecular complex formation at 1280, 1124, and 534/cm and also indicated a band for S-O stretching at 940/cm.

30345 **APTIC NO. 51750**

Hiroyasu, Hiroyuki, Toshikazu Tsunoda, and Atsushi Sakane

COMBUSTION SIMULATION WITH THE COMBUSTION ROOM SHAPE AND TURBULENCE OF UNIFORMLY MIXED GAS. *(Kimitsu kongoki no nenshoshitsu keijo oyobi midare o toriireta nensho shimyureshon). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 63-74, 1973. 11 refs. (Presented at the Society of Automotive Engineers of Japan, Study Meeting 27th, Tokyo, May 23-24, 1973, Paper 7.)*

Combustion changes and exhaust characteristics of a uniformly mixed gas were measured using a 172 cu cm combustion vessel. As the richness of the gas increased, maximum pressure and rising pressure rate increased, showing a maximum when the richness was fairly higher than the theoretical mixing ratio. The combustion period and maximum pressure arrival time decreased as the gas richness increased, but further increases in richness increased the times. Exhaust gas composition depended on the mixing ratio; the nitrogen oxide emission became maximum when richness was slightly thinner than the theoretical mixing ratio, and carbon monoxide and hydrocarbons increased as the richness increased over the theoretical mixing ratio. As the fluid in the gas increased, the maximum pressure and the rising rate of pressure increased, showing that it was greatly affected when the richness was high. The combustion period and maximum pressure arrival time were short if the mixed gas had a fluid, thus making combustion rapid.

30346 **APTIC NO. 51788**

Holmes, John R., Robert J. O Brien, James H. Crabtree, Thomas A. Hecht, and John H. Seinfeld

MEASUREMENT OF ULTRAVIOLET RADIATION INTENSITY IN PHOTOCHEMICAL SMOG STUDIES. *Environ. Sci. Technol., 7(6):519-523, June 1973. 20 refs.*

The objective of this work is to eliminate entirely the fictitious first order rate constant used to characterize the nonlinear nitrogen dioxide-time behavior in a photochemical smog system in favor of direct measurement. The primary photolysis rate constant is reported. A simple method of determining directly the actual rate constant for NO2 photolysis, in systems of NO2 and nitrogen, is developed based on both experimental and theoretical studies. The mechanism employed in interpreting the photolysis of ppm levels of NO2 in N2 and oxygen is presented. The feasibility of using this method in the range of 1-7 ppm of NO2 and 0-50 ppm of nitrogen oxides is discussed.

30347 **APTIC NO. 52072**

Joshi, R. C. and E. A. Rosauer

POZZOLANIC ACTIVITY IN SYNTHETIC FLY ASHES: I, EXPERIMENTAL PRODUCTION AND CHARACTERIZATION. *Ceram. Bull., 52(5):456-459, May 1973. 9 refs. (Presented at American Ceramic Society, Annual Meeting, 73rd, Chicago, Ill., Apr. 27, 1971.)*

As part of an effort to better understand the nature of the pozzolanic activity of fly ashes, synthetic fly ashes were produced by subjecting various mixtures of natural coal minerals to conditions simulating those found in suspension-fired furnaces. The physical properties of a synthetic fly ash prepared from kaolinite depended primarily on the nature of the thermal treatment; prolonged heat treatment promoted sintering and devitrification, which in turn influenced other properties. In synthetic ashes prepared from kaolinite and pyrite, agglomeration of opaque material and an isotropic glassy phase occurred. Fly ashes created from mixtures of kaolinite and calcite were characterized by an unusaully large number of particles less than 0.4 micron in size. Finally, synthetic ashes prepared from mixtures of kaolinite, calcite, and pyrite were characterized by the presence of calcium sulfate, and also contained surprisingly large amounts of very small particles. (Author conclusions modified)

30348 **APTIC NO. 51753**

Kamra, A. K.

EXPERIMENTAL STUDY OF THE ELECTRIFICATION PRODUCED BY DISPERSION OF DUST INTO THE AIR. *J. Appl. Phys., 44(1):125-131, Jan. 1973. 11 refs.*

Laboratory experiments were performed to study the electrification of dust clouds created by blowing different types of dusts into a dust chamber. The polarity and magnitude of the space charge in such dust clouds are sensitive to the mineral constituents of the dust. Even a single dust cloud, if allowed to settle under gravity in a field-free space with no charge added to it can have opposite polarities of space charge at different times of its sedimentation. The space charge produced increases with an increase in the length of the surface over which the dust is blown. It also increases with an increase in the temperature and velocity and a decrease in the relative humidity of the blowing air. External electric fields of up to a few hundred V/cm, applied to the surface from which the dust is blown, have little effect on the generated space charge. Size distributions of positively and negatively charged particles show a greater abundance of smaller approximately 3 micron particles compared to those of small neutral particles. (Author abstract)

30349 **APTIC NO. 52205**

Kass, L. Michael and Paul M. Junemann

COMPUTER USES FOR COAL MINE ENGINEERING AND GEOLOGY. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Society of Mining Engineers, 14p., 1973. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 102nd, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-AR-100.)*

Because of the increasing complexity of planning for coal mines and land reclamation, a case study was undertaken to evaluate the usefulness of computer techniques to assist mining engineers and geologists in mapping coal deposits, evaluating coal reserves, strip mine planning and land management. The data used in the study was provided by the Illinois State Geologic Survey. Some of the results of that study are described. Considerations for the development of a computer data base for coal deposits are presented. A series of analytical techniques for processing the data is described. The case study is presented to illustrate how the coal data base and the analytical techniques could be used in actual practice. One extension of these techniques is mapping coal deposits across the coal seam for sulfur, ash, and calorie content of coal.

30350 **APTIC NO. 51947**

Leisey, Frank A.

CONTINUOUS ANALYZER FOR LEAD IN GASOLINE. *ISA (Instr. Soc. Am.) Trans., 12(1):78-81, 1973. 5 refs. (Presented at the Instrument Society of America, Analysis Instrumentation Symposium, San Francisco, Calif., May 3-5, 1972.)*

Continuous gasoline blending operations require frequent checks to assure that the lead antiknock content is within the desired range. A recording tetraethyl lead analyzer automatically samples a blend every 5 min and provides a continuous readout. The instrument mixes an alcoholic silver ion reagent with a sample of gasoline. The lead compounds in the gasoline react with the reagent to form a precipitate. The optical density of this reaction mixture is proportional to the lead content of the gasoline and is measured at 460 nm by a photoelectric colorimeter. With daily calibration, an accuracy within 0.1 g/gal tetraethyl lead can be maintained over the instrument range of 04 g/gal. Equally satisfactory results are obtained on mixtures of various methyl and ethyl compounds of lead, although each requires a separate calibration. (Author abstract modified)

30351 **APTIC NO. 51955**

Philipson, Klas

ON THE PRODUCTION OF MONODISPERSE PARTICLES WITH A SPINNING DISC. *Aerosol Sci., 4(1):51-57, Jan. 1973. 10 refs.*

An apparatus for the production of monodisperse particles, based on the spinning disc principle, was constructed. This spinning disc proved to be a useful tool for generating monodisperse particles in the size range of 2-20 micron. The electronically controlled valve for turbine air supply gave a reliable and adequate method for operating a spinning disc under accurate speed control. The apparatus was tested in production of polystyrene particles, and it was possible to make these with a standard deviation in particle size of 4% in diameter. The drop formation process at the edge of the disc was photographed with a ruby laser technique. From the pictures, the formation of drops, satellite drops, and double drops was determined.

30352 **APTIC NO. 51868**

Reshetov, V. A. and I. I. Ioffe

TRANSIENT STATE OF THE BINARY GAS DIFFUSION IN POROUS MEDIA. *(Perekhodnyy rezhim binarnoy diffuzii gazov v poristykh sredakh). Text in Russian. Zh. Prikl. Khim., 46(3):539-545, 1973. 8 refs.*

The transient state of binary gas diffusion in a porous media such as absorbents and catalysts was studied with nitrogen, argon, oxygen, and carbon dioxide. Formula for the determination of the ratio of diffusional flows for the transient state of gas diffusion in porous media, having a limit of one, is presented. Transient state of diffusion in porous media with monodisperse structure occurred for Knudsen numbers ranging from 0.002 to 1.4. The lowest Knudsen number for nitrogen, argon, and oxygen diffusion flows was 0.007. Considerable divergence of experimentally obtained ratios from theoretical ones was determined for the diffusion of nitrogen and carbon dioxide, which may be due to a superficial flow of carbon dioxide. Formula for the computation of diffusional flows and of their ratios from experimental data is given.

30353 **APTIC NO. 52048**

Richmond, P. and K. W. Sarkies

THE INTERACTION OF ADSORBED MOLECULES. *J. Phys. C., 6(3):404-410, 1973. 14 refs.*

The dispersion interaction between two atoms in the presence of a plane continuum dielectric substrate is calculated using Lifshitz theory. If the atoms are in a plane parallel to the substrate, the effect of the latter is to renormalize the Hamaker constant. This renormalization affects the two dimensional van der Waals gas critical temperature used in adsorption calculations. It is strongly dependent on the distance of the adsorbate molecules from the surface. (Author abstract)

30354 **APTIC NO. 51898**

Sehmel, G. A.

30355 **APTIC NO. 51737**

Stedman, D. H. and H. Niki

OZONOLYSIS RATES OF SOME ATMOSPHERIC GASES. *Environ. Letters, 4(4):303-310, 1973. 10 refs.*

Rate constants were measured for the gas phase reactions of ppm concentrations of ozone in air with acetylene, acetaldehyde, and toluene as 8.6 plus or minus 0.9, 3.4 plus or minus 0.5, and 1.2 plus or minus 0.6 times 10 to the negative 20th power cu cm/molecule/sec, respectively, using the ozone/nitric oxide chemiluminescence detector. Toluene, xylene, methane and carbon monoxide were also investigated, and upper limits for the rate constants were obtained. Combination with data on olefins and oxides of nitrogen gave a quantitative assessment of the various contributions to the removal of atmospheric ozone. (Author summary)

30356 **APTIC NO. 51979**

Taylor, G. W. and D. W. Setser

QUENCHING RATE CONSTANTS FOR CO (A 3PI; NU PRIME EQUALS 0, 1, 2). *J. Chem. Phys., 58(11):4840-4851, June 1, 1973. 29 refs.*

The quenching rate constants for carbon monoxide with hydrogen, deuterium, nitrogen, oxygen, nitric oxide, carbon monoxide, carbon dioxide, carbonyl sulfide, carbon disulfide, sulfur dioxide, ammonia, methane, ethylene, ethane, sulfur hexafluoride, and cyanogen were measured in a discharge-flow apparatus. For these reagents the mechanism of quenching is discussed. Only the rate constants for N2, CO2, C2F6 showed a dependence upon the vibrational excitation of CO. The reaction between N2 and CO is discussed in an appendix. (Author abstract modified)

30357 **APTIC NO. 51768**

Wampler, Fred B., Jack G. Calvert, and Edward K. Damon

A STUDY OF THE BIMOLECULAR INTERSYSTEM CROSSING REACTION INDUCED IN THE FIRST EXCITED SINGLET OF SO2 BY COLLISIONS WITH O2 AND OTHER ATMOSPHERIC GASES. *Intern. J. Chem. Kinet., 5(1):107-117, Jan. 1973. 14 refs.*

The relative intensities of phosphorescence of sulfur dioxide molecules in the first excited triplet state were determined following the optical excitation of molecules by a 2662 A laser pulse. From a kinetic treatment of these measurements, the intersystem crossing ratio was determined. These data allow a new, more quantitative evaluation of the extent of involvement of the excess triplet SO2 in the 3130 A-irradiated mixtures of SO2 and carbon monoxide at high pressures. The new data are also of direct interest in the determination of the theoretical maximum rates of photooxidation of SO2 in the sunlight-irradiated atmosphere of the earth. (Author abstract modified)

30358 **APTIC NO. 52074**

Wasan, D. T., S. K. Sood, R. D. Davies, and A. Lieberman

AEROSOL TRANSPORT: PARTICLE CHARGE AND RE-ENTRAINMENT EFFECTS. *J. Colloid Interface Sci., 43(1):144-149, April 1973. 29 refs. (Presented at National Colloid Symposium, 45th, Georgia Institute of Technology, Atlanta, June 21-23, 1971.)*

A theoretical and experimental analysis of the deposition of particles is presented. The deposition of particles is extremely sensitive to particle size and velocity of flow through a tube. Flow velocities should not, however, be so low as to permit appreciable deposition due to gravity settling. Re-entrainment of deposited particles can be reduced by maintaining flow through the tube at a low Reynolds number. Because the deposition of charged particles is very high, an effort should be made to minimize the space charge on the particles. (Author conclusions modified)

30359 **APTIC NO. 52045**

Watanabe, K., T. Kondow, M. Soma, T. Onishi, and K. Tamaru

MOLECULAR-SIEVE TYPE SORPTION ON ALKALI GRAPHITE INTERCALATION COMPOUNDS. *Proc. Roy. Soc. London, Ser. A, 333(1592):51-67, April 17, 1973. 20 refs.*

The sorption of hydrogen, deuterium, nitrogen, methane, and rare gases was studied on alkali graphites C8M and C24M (M stands for potassium, rubidium, and cesium) at 196-63 K. The alkali graphites were synthesized by the dual furnace method. Sorption measurements were made by the constant-volume method at 1 atm to 1 Pa. The The C24M compounds sorbed gases to various degrees, while all the C8M compounds were nonsorptive. Systematic study of the sorption isotherms for all the compound-gas systems revealed that the thermodynamic aspects of sorption depended on the size of the gas molecules and the size of the intercalated alkali atoms. Sorption of binary gas mixtures on C24K was studied by measuring uptake by mercury manometer and analyzing gas-phase composition by gas chromatography. The results indicated that sorption on alkali graphites is of a molecular-sieve type. Neutron diffraction analysis if the system C24K-D2 confirmed that sorption is due to the occlusion of gas molecules between the intercalated carbon layers of graphite, and it is suggested that alkali graphites expand with sorption. The nonsorptivity of the C8M compounds was ascribed to steric hindrance by the intercalated lattice. (Author abstract modified)

30360 **APTIC NO. 51775**

Wollrab, James E. and Richard L. Rasmussen

LIFETIME OF GAS-PHASE CARBON MONOSULFIDE. *J. Chem. Phys., 58(10):4702-4703, May 15, 1973. 3 refs.*

Some quantitative data were obtained concerning the lifetime of gas-phase carbon monosulfide (CS) produced in a 60 Hz discharge through carbon disulfide over a range of initial pressures of the parent CS2 molecule with a near-semiconfocal Fabry-Perot resonator enclosed in a glass chamber. For relatively small concentration of CS, the decrease in CS concentration can be followed by monitoring the maximum value of the absorption coefficient. In the presence of large amounts of CS2, the variation of the absorption coefficient for CS is a direct measure of CS concentration perturbed only slightly by the possible formation of CS2 at the walls. The rate of removal of CS from the volume sampled by the microwave resonator is governed by a first-order process which is strongly dependent upon the condition of the surfaces within the sample cell. After a sufficient number of discharges in CS2 have occurred, the surface of the absorption cell appears to become saturated with reactive sites and the minimum effective half-life of CS monomer is reached.

30361 **APTIC NO. 52296**

Yamamoto, Kyoto, Michiharu Seki, and Kunitaro Kawazoe

EFFECT OF SULFURIC ACID ACCUMULATION ON THE RATE OF SULFUR DIOXIDE OXIDATION ON ACTIVATED CARBON SURFACE. *(Kasseitanjo no nisanka iosanka hanno ni okeru ryusan chikusekiryo to ryusan seisei sokudo). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 7:1268-1279, July 1973. 16 refs.*

In the presence of oxygen and water, sulfur dioxide is oxidized to sulfuric acid on the surface of activated carbon. A relation between the rate of oxidation and the amount of accumulated sulfuric acid was investigated. The rate of the reaction was kept constant, as long as the amount of H2SO4 was less than 10% by weight of the carbon in terms of sulfur dioxide. When the amount exceeded 10% weight of the carbon, the rate gradually decreased with the reaction time and became constant at a lower rate. The reaction continued, even when H2SO4 was liberated from the carbon. The experimental results obtained from the spring balance method and the packed column method suggested that the reaction in the first two experimental steps proceeded on the surfaces of both micropores and macropores, while the reaction in the third step occurred on the macropores. The rate of the reaction in micropores linearly decreased with the volume occupied by H2SO4 in the pores, till the micropores were filled up by H2SO4. The relation between the rate of reaction and the amount of the product was described by a model.

1972

30362 **APTIC NO. 51847**

Aczel, Thomas

APPLICATIONS OF HIGH RESOLUTION MASS SPECTROMETRY TO THE ANALYSIS OF COMPLEX AROMATIC MIXTURES DERIVED FROM PETROLEUM AND COAL LIQUIDS. *Rev. Anal. Chem., 1(3):226-261, 1972. 26 refs.*

High resolution mass spectrometry combined with low voltage techniques provides the analyst with a very detailed characterization of aromatic and polar concentrates. Composition and many related parameters such as molecular weight, elemental analysis, and distillation characteristics can be determined with one analysis. The method is applicable to mixtures boiling from 150-1200 F. Aromatic and polar materials in crude oils, shale oils, process petroleum streams, and coal liquids can be analyzed with or without previous separation in disillate and chromatographic fractions. Instrumentally, high resolution is achieved by double focusing. High resolution instruments are provided with variable, narrow slits at the exist of the ion beam from the source and magnetic field, and the narrowing of the slit width also increases resolving power. The use of low voltage conditions simplifies calibration procedures. The most efficient handling of high resolution data is through a computerized data acquisition system. Quantitative and qualitative data provided by one computer system on the composition of materials derived from petroleum and coal liquids are given.

30363 **APTIC NO. 52256**

Gaillard-Cusin, Francoise and Henri James

MECHANISM OF CARBON MONOXIDE COMBUSTION AT HIGH PRESSURES. *(Sur le mechanisme de combustion de l oxyde de carbone a hautes pressions). Text in French. C. R. Acad. Sci. (Paris), Ser. C, 274(13):1248-1251, March 1972. 8 refs.*

In the initial stage of the combustion of carbon monoxide (with CO/oxygen equal to 2:3) at 450-650 deg and a pressure of 10-500 torr in a silicon dioxide reaction enclosure, the rate of the chain-initiating processes had a negative pressure coefficient. In the second reaction stage, the concentration of chain propagating species reached a steady state corresponding to the maximum light intensity emitted by the excited carbon dioxide molecules, and the maximum light intensity decreased with increasing pressure, without the occurrence of a recrudescence of activity at high pressures. The absence of a high-pressure explosion limit was explained by chain-initiating reactions arising from the competitive chemisorption of O_2 and CO on the SiO_2 walls.

30364 **APTIC NO. 52249**

Haines, A. K., R. P. King, and E. T. Woodburn

THE INTERRELATIONSHIP BETWEEN BUBBLE MOTION AND SOLIDS MIXING IN A GAS FLUIDIZED BED. *Am. Inst. Chem. Engrs. J., 18(3):591-599, May 1972. 37 refs.*

The stochastic differential equations for particle motion in a homogeneous fluidized bed have been modified to incorporate a bubble-particle interaction. In a freely bubbling bed this interaction causes an instantaneous random step upwards when a particle collides with a bubble. In addition, the particles are subject to Brownian motion due to particle-particle interactions and to a vertical drift velocity. The particle motion was modeled by a set of stochastic differential equations which were solved, and the form of the probability density function was obtained. Predictions are in terms of the mean bubble frequency at a point, the average displacement associated with a particle bubble collision and the dense phase diffusion coefficient. The model was tested experimentally using random forcing function techniques. All parameters were evaluated independently. (Author abstract modified)

30365 **APTIC NO. 52254**

Hanna, Owen T. and Orville C. Sandall

DEVELOPED TURBULENT TRANSPORT IN DUCTS FOR LARGE PRANDTL OR SCHMIDT NUMBERS. *Am. Inst. Chem. Engrs. J., 18(3):527-533, May 1972. 14 refs.*

Developed turbulent heat or mass transfer in ducts with large Prandtl or Schmidt numbers are discussed. High Prandtl or Schmidt number asymptotic formulae have been derived for the Stanton number in turbulent duct flows. In the limit of large Prandtl numbers, the results are equivalent for the parallel plate, circular tube, and concentric annuli geometries. In addition, the boundary conditions of constant wall heat flux and constant wall temperature give equivalent results. The theoretical expressions derived show good agreement with typical numerical calculations down to relatively low Prandtl or Schmidt number values. A comparison of the formulae obtained with recent large Schmidt number mass transfer data shows good agreement. (Author conclusions modified)

30366 **APTIC NO. 52246**

Holland-Batt, A. B.

TWO-DIMENSIONAL MOTION OF PARTICLES ACCELERATING IN FLUIDS. *Trans. Inst. Chem. Engr. (London), 50(2):156-167, April 1972. 2 refs.*

Techniques for determining the trajectories of particles experiencing unsteady, two-dimensional motion are described. They are based on the use of four different Reynolds numbers to describe the particle behaviour and may be employed for terminal Reynolds numbers ranging from zero to 200,000. They can be used to calculate trajectories of particles in the transitional and turbulent regimes. (Author abstract modified)

30367 **APTIC NO. 52380**

Kim, D. S., L. E. Gates, and Robert S. Brodkey

A MATHEMATICAL MODEL FOR HEAT TRANSFER IN A PACKED BED AND A SIMPLIFIED SOLUTION THEREOF. *Am. Inst. Chem. Engrs. J., 18(3):623-627, May 1972. 10 refs.*

Heat transfer in packed beds can be mathematically modeled to account for the heat transfer between the particles and the gas phase, the conduction through the solid phase of particles, and the mixing or dispersion within the gas phase in the void structure of the porous media. To solve the resulting differential equations numerically is not easy. The solution for sinusoidal gas temperature input assumes linearity of the logarithm of the temperature with time. If, in addition, linearity with distance can be assumed, then the solution can be vastly simplified to finding the real root of a fourth-order algebraic equation. (Author abstract)

30368 **APTIC NO. 51867**

Kim, N. S. and I. G. Mamonova

ON THE AXIAL MOVEMENT OF AEROSOL PARTICLES ALONG THE NOZZLE - WORKING PART SECTION OF AERODYNAMIC TUBES. *(O dvizhenii chastits aerozolya po osi aerodinamicheskoy truby na uchastke soplo - rabochaya chast). Text in Russian. Tr. Eksp. Issled. Fiz. Oblakov Prib., 1(33):57-64, 1972. 5 refs.*

Calculations of the axial motion of quartz and water aerosol particles along the nozzle and working part sections of aerodynamic tubes are presented. The aerosol particles are assumed to be spherical and thus have no influence on the motion of air and of other particles, and the air flow rate along the axis of the tube is assumed to be equal to the average flow rate in the given cross section. A non-linear differential equation of the motion of aerosol particles was obtained on the basis of Klyachko s formula. The lag of aerosol particles within the nozzle section, relative to the velocity of the air stream, increased with flow rate, particle size, and particle density. The aerosol particles, especially those of small size, assumed almost the velocity of the air stream when entering the working section of the aerodynamic tube. This applies to quartz and water aerosol particles with a maximum diameter of 10 micron at a maximum flow rate of 100 m/sec, and to such with a maximum diameter of 50 micron at a maximum flow rate of 10 m/sec, which had a velocity difference of about 0.001%. Otherwise, the velocity difference in any point of the working section of the aerodynamic tube usually exceeded 1%.

30369 **APTIC NO. 52251**

King, G. H., H. W. Kroto, and R. J. Suffolk

THE PHOTOELECTRON SPECTRUM OF A SHORT-LIVED SPECIES IN THE DECOMPOSITION PRODUCTS OF CS_2. *Chem. Phys. Letters (Amsterdam), 13(5):457-458, April 1, 1972. 4 refs.*

A vacuum ultraviolet photoelectron spectrum of a short-lived species produced by a microwave discharge through carbon disulfide vapor is assigned to carbon sulfide. The CS spectrum consists of a well resolved simple progression of four components separated by 1290/cm with an adiabatic ionization potential at 11.33 eV (this is also the vertical ionization potential), and a band originating at 12.56 eV with intervals of 980/cm between components. Pure CS_2 also has a band with an adiabatic ionization energy of 12.56 eV, but the component separation is 550/cm.

30370 **APTIC NO. 52394**

Kubarev, S. I., E. A. Pshenichnov, and A. S. Shoostov

MAGNETIC FIELD EFFECT OF PHOTOOXIDATION RATE OF SOME AROMATIC HYDROCARBONS. *Chem. Phys. Letters (Amsterdam), 13(5):485-487, April 1, 1972. 8 refs.*

An explanation of the effect of magnetic field on the photooxidation rate of some aromatic hydrocarbons is given. The results have been obtained for a monocrystalline sample. For a polycrystalline sample the effective rate constant can be found by averaging in all the magnetic field strength directions.

30371 **APTIC NO. 52396**

Spencer, William F. and Mark M. Cliath

VOLATIITY OF DDT AND RELATED COMPOUNDS. *J. Agr. Food Chem., 20(3):645-649, May-June 1972. 17 refs. (Presented at the American Chemical Society, Division of Pesticide Chemistry, Meeting, 162nd, Washington, D. C., Sept. 1971.)*

Vapor pressures of two DDT isomers and some of their degradation products were measured by a gas saturation method. The vapor pressure of o,p-DDT was 7.5 times that of p,p-DDT, indicating that o,p isomers are more volatile than p,p isomers. At 30 C, the atmosphere above a surface deposit of technical grade DDT contained approximately 62% o,p-DDT, 16%, o,p-DDE, 14%, p,p-DDE, and only 8% p,p-DDT. When technical grade DDT was applied to moist soil at concentrations up to 20 micrograms/g, the atmosphere in and above the soil contained approximately equal quantities of o,p-DDT and p,p-DDT; at higher concentrations the ratio of o,p to p,p-DDT in the vapor phase increased. Dieldrin applied with DDT did not affect DDT vapor density and the interaction between o,p and p,p-DDT was slight. Air drying of soil reduced volatility of all compounds. The primary breakdown product of DDT, p,p-DDE, had a higher vapor pressure than the original compound, p,p-DDT, which indicates that much of the DDT now present in soil may volatilize as DDE. (Author abstract modified)

30372 **APTIC NO. 52433**

Squires, Patrick

DIFFUSION CHAMBERS FOR THE MEASUREMENT OF CLOUD NUCLEI. *J. Rech. Atmospheriques, 6(1-3):565-572, Jan.-Sept. 1972. 16 refs.*

The design and application of diffusion chambers for the study of cloud nuclei are examined. The effects on reliability of measurements of transient supersaturations, diameter-to-height ratio, sample entry manner, approach to equilibria of chamber conditions, and other design and operating variables were studied. The major conclusions about the design and operating parameters included the following: the chamber depth should not exceed about 1 cm; measurements may not be reliable below about 0.1%; excessive nuclei concentrations can cause serious errors; if the top plate is heated to a temperature above ambient, the entering sample should be warmed to at least that temperature in contact with dry surfaces. (Author abstract modified)

30373 **APTIC NO. 52392**

Staley, D. O.

HEAT CONDUCTION IN THE VICINITY OF A GROWING DROPLET. *J. Atmospheric Sci., 29(1):206-208, Jan. 1972. 8 refs.*

The purpose of this investigation is to correct an error in the conventional physical basis for the heat conduction constraint in the diffusion-conduction theory of droplet growth. The error consists of expressing the heat conduction as the product of thermal conductivity and temperature gradient, a formulation which is approximately valid only in the absence of mass transfer. In the case of a growing droplet, net mass transfer is inward and obviously large, since liquid water displaces and replaces air initially at the droplet location. Inclusion of the additonal heat transport associated with mass diffusion does not lead, when total energy conservation is required, to an altered heat conduction constraint, only to physically more realistic basis for it. The derived constraint is identical with that given by Maxwell, who simply equated the rate of latent heat release to the heat conduction associated with the temperature gradient.

30374 **APTIC NO. 52238**

Warneck, Peter

INVESTIGATION OF ION REACTIONS USING PHOTOIONIZATION MASS SPECTROMETRY. V. REACTIONS OF N2+ AND CO+. *(Untersuchungen von Ionenreaktionen mittels Photoionisations-Massenspektrometrie. V. Reaktionen von N2+ und CO+). Text in German. Ber. Bunsenges. Physik. Chem., 76(5):413-420, 1972. 50 refs.*

The reactions of the ions of molecular nitrogen and carbon monoxide with nine neutral reactants (hydrogen, carbon dioxide, methane, nitrous oxide, sulfur dioxide, oxygen, acetylene, carbonyl sulfide, and nitric oxide) were investigated with respect to their rate coefficients and product distributions. For comparison, rate coefficients were calculated according to the theory of Gioumousis and Stevenson; the theory predicts for reactions of both ions with the same neutral reactant equivalent rate coefficients, provided the reaction probability is unity. With few exceptions, the experimental results indicated equivalent values for the rate coefficients even when the reaction probabilities were less than unity. The predominant reaction channel is charge transfer, but in the reactions of CO(-) rearrangement was observed with comparable frequency. The reaction mechanism is dominated by the strength of the chemical interaction during close contact of the reactants. This aspect is discussed on the basis of a potential energy model illustrated by the reaction of N2(+) with O.

30375 **APTIC NO. 52220**

Young, Robert H. and Robert L. Martin

ON THE MECHANISM OF QUENCHING OF SINGLE OXYGEN BY AMINES. *J. Am. Chem. Soc., 94(15):5183-5185, July 27, 1972. 16 refs.*

Rate constants for the quenching of singlet oxygen by diazobicyclooctane (Dabco) (I) and triethylamine were compared with the rate of quenching of the singlet state of some aromatic compounds. The results of the quenching experiments indicate that there is a relationship between the mechanism of quenching of singlet oxygen and the quenching of the fluorescence of the aromatic compounds. A good correlation was obtained between the log of the rate constant for quenching and a measure of the electron affinity of singlet states including singlet oxygen. These results suggest that quenching of singlet oxygen and singlet state aromatic compounds by amines proceeds through charge-transfer states. Results in both methanol and 1-butanol for Dabco were obtained but almost no solvent effect was observed, indicating only partial charge-transfer. (Author abstract modified)

EFFECTS-HUMAN HEALTH

1973

30376 **APTIC NO. 52027**

Japan Environmental Agency

ENVIRONMENTAL WHITE PAPER (1973), NEW RULES FOR THE PROTECTION OF THE ENVIRONMENT. *(Showa 48-nenban Kankyo Hakusho, kankyo hozen e no atarashii ruru). Text in Japanese. 601p., 1973.*

The 1973 compendium of all the investigations and activities for 1972 related to environmental protection by the Japanese government includes the following discussion topics: the characteristics of recent environmental problems, the urban development and the environment, the road for environmental management, new rules for environmental protection, the progress of environmental administration, the present condition and countermeasures for air pollution, the present condition and countermeasures for water pollution, conditions and measures for other types of public nuisance, the present condition and measures for health damages caused by pollution, the present condition and safety measures for natural environment, investigations and research concerning environmental protection, and the progress of other administrative matters concerning the environment. The administrative guidelines for 1973 are further discussed. The photochemical smog victims for 1972 in the Tokyo and Osaka areas were 2245 between April and November. This figure is based on reports made by individuals to local government and health organizations and is not an accurate count. In most cases the symptoms were light and were eye irritation and throat pain, but there were also serious breathing difficulty, numbness of the limbs, and convulsions; several required hospitalization and special treatment. Most of serious cases occurred during active exercises out of doors. The investigation conducted in Niigata Prefecture concerning the fluoride emission by Mitsubishi Chemical Industries between 1970 and 1972 showed some cases of mottly teeth and anomalies of bone and teeth formation, but no significant difference from those of control areas.

30377 **APTIC NO. 52092**

Abe, Hiroshi, Shigeharu Urakabe, Minoru Sugita, Motoaki Shichiri, Toshihiko Suematsu, and Yoshimasa Orita

POLLUTION AND HEALTH INJURY: A METHOD FOR INVESTIGATION OF HEALTH IMPAIRMENT BY HEAVY METALS. *(Kogai to kenko shogai: jukinzoku ni yoru seitai shogai no toraekata). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):2017-2026, June 1973. 53 refs.*

As a basic study for the metal residues in the living environment and their impairment of human health, various methods for examining trace metals are reviewed. The definition of trace elements, heavy metals in the generation of life and environmental changes, toxicity tests for trace metals (acute, sub-acute, and chronic), heavy metals and internal organ damage, and methods of examining the effects of traceable heavy metals on the human body are discussed. The effects of heavy metals can be examined by metallothionein, by the suspected carrier protein of metals, by analyses of damage symptoms on the cellular level, by the effects of metals on bio-membranes, cell nuclei, and cell granules, by the significance of heavy metals from the enzymological standpoint, and by the exchange effects of metals and the stability constant.

30378 **APTIC NO. 52432**

Baker, F. D., C. F. Tumasonis, and Janis Barron

THE EFFECT OF CARBON MONOXIDE INHALATION ON THE MIXED-FUNCTION OXIDASE ACTIVITY IN THE CHICK EMBRYO AND THE ADULT MOUSE. *Bull. Environ. Contamination Toxicol., 9(6):329-336, June 1973. 16 refs.*

The effect of carbon monoxide (425 ppm) on two enzymes of the mixed-function oxidase (mfo) system, hydroxylase and O-demethylase, in the liver of 12 and 17-day-old CO-exposed chick embryos was investigated. The livers of mice were also analyzed for mfo activity following a 1-week exposure to 100, 250, and 500 ppm of CO. The carboxyhemoglobin (COHb) levels of the exposed embryos and the mice were calculated. The mfo activity of the chick embryos was age and exposure-related. Hydroxylase and O-demethylase activity increased with incubation age and changed significantly with CO-exposure. After 1 week of exposure to 500 ppm CO, the activity level of the two enzymes in the rats increased significantly.

30379 **APTIC NO. 52040**

Bouhuys, Arend

LUNG FUNCTION AS A MONITOR FOR POLLUTANT EFFECTS. *Preprint, Federation of American Societies for Experimental Biology, Washington, D. C., 3p., 1973. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 57th Atlantic City, N. J., April 16, 1973.)*

Pollutant effects on small airways can be measured by quantitating changes in the rates at which air can be expired. These air flow rates are graphically displayed in flow-volume curves, which eliminate the need for pressure measurements. Forced expiration flow-volume curves have demonstrated flow rate reductions following exposure to histamine aerosol, cotton dust, and cigarette smoke. Partial expiratory flow-volume curves have demonstrated acute airway responses in healthy subjects exposed to 1 ppm sulfur dioxide for 1-5 min, or to hair spray aerosols for 30 sec. Studies of long-term damage from community air pollution are being conducted using a mobile laboratory with on-line data recording with a digital computer. The results of the studies will allow detailed comparison of lung function in urban and rural residents in which the variables of age, sex, smoking habits, and occupational or domestic pollutant exposures can be taken into account.

30380 **APTIC NO. 52303**

Bourbon, P., P. Levy, G. Bompart, and J. -L. Laborie

STUDY OF THE ACTION OF SULFUR DIOXIDE ON THE RAT ALVEOLAR MACROPHAGES. *(Contribution a l etude de l action du dioxyde de soufre sur le macrophage alveolaire du rat). Text in French. Eur. J. Toxicol. Hyg. Environ., 6(1):32-35, Jan.-Feb. 1973. 7 refs.*

The action of 22, 7, and 2 micrograms/ml of sulfur dioxide on rat alveolar macrophages was studied in vitro. Linear decrease in the rate of survival after a 1-hour incubation with increasing SO2 concentration was determined by the tryphan blue method. The survival rate was determined primarily by the pH value of the solution rather than by the action of SO2 proper. Adenosine triphosphatase activity was evident only in living macrophages. The activity of the lactate, malate, isocitrate, and succinate dehygrogenases was very appreciably enhanced after incubation for 1 hr.

30381 **APTIC NO. 51928**

Capurro, Pietro U.

EFFECTS OF EXPOSURE TO SOLVENTS CAUSED BY AIR POLLUTION WITH SPECIAL REFERENCE TO CCL4 AND ITS DISTRIBUTION IN AIR. *Clin. Toxicol., 6(1):109-124, 1973. 6 refs. (Presented at the American Academy of Clinical Toxicology, Annual Meeting, 4th, Philadelphia, Pa., Oct. 23, 1971.)*

Threshold limit values of solvents in ambient air are mentioned. Consideration of several chemicals in the ambient area should lower this threshold value markedly in multiple fashion. Several symptoms caused by low levels of chemicals in mixtures in ambient areas are described. A large variety of chemicals, including chlorinated and nonchlorinated hydrocarbons were studied. Identification was done using gas chromatography with flame and electron capture detectors. Solvents such as benzene, toluene, and carbon tetrachloride were found in the blood of several people who presented symptoms such as abdominal pain, fatigue, abnormal glucose tolerance, abnormal insulin curves, and abnormal pancreatic scans.

30382 **APTIC NO. 52430**

Chien, James C. W.

ALKALINE BOHR EFFECT OF NITRIC OXIDE BINDING BY HEMOGLOBIN. *Biochem. Biophys. Res. Commun., 52(4):1338-1340, June 19, 1973. 8 refs.*

The alkaline Bohr effect of nitric oxide binding by hemoglobin was determined by differential titration. The Bohr effect was determined from pH 6.4 to 8.1 at 0.2 pH intervals. The Bohr effect for oxygen equilibrium was determined. The results show that binding of NO by hemoglobin releases the same number of protons as the binding of oxygen. Binding of NO releases 2.6 protons per hemoglobin tetramer. (Author summary modified)

30383 **APTIC NO. 52491**

Cocude, M.

AIR POLLUTION AND HOMEOPATHY CHEMICAL COMPOUNDS PRESENT IN MINUTE CONCENTRATIONS IN THE ATMOSPHERE - ARE THEY POLLUTANTS OR REMEDIES? (Pollution atmosphérique et homeopathie: les composes chimiques dans l atmosphere a tres faible concentration sont-ils des polluants ou des remedes)? Text in French. Pollut. Atmos. (Paris), 15(57):9-16, Jan.-March 1973. 3 refs.

The atmosphere contains chemical elements stemming from the combustion of fuel oil or from gasoline. Sulfur can be as high as 10,000 ppm. Sulfur is followed far behind by vanadium, chlorine, and nickel with concentrations up to 10 ppm. Then follow aluminum, bromine, sodium, zinc, barium, and antimony. Indium, arsenic, and other elements are present in trace quantities. Vanadium, present in fuel oils used in France in quantities from a few to tens of ppm, is present in several Middle Eastern crudes in amounts of 14 to 60 ppm. The content of lead in gasoline is currently 0.64 g/l (tetraethyl lead). The atmospheres of Lyon and Paris contain from 2 to 3 micrograms Pb/cu m. The order of magnitude of both sulfur and of lead is the same for the atmosphere as for oil or its products. The order of magnitude in the atmosphere of concentrations of vanadium, chlorine, and nickel is 1000 times lower than concentrations of sulfur and lead, that of manganese and gallium is a million times lower than of sulfur, with aluminum, zinc, and sodium in an intermediary position. The concentration of sulfur in the air is comparable to that in homeopathic medicines, the same applies to some of the other elements. The difficulty in determining how these affect the human body, as in many other epidemiological studies, is that of separating the effect of atmospheric pollution from other factors like age, sex, nutrition, habitat, personal habits, and way of life. Sometimes a toxic element has beneficial effects in small quantities, such as in the case of arsenic. Perhaps heomepathic doses of pollutants should be used to immunize people against pollution. It may be that man in the year 2200 will be very well adapted to the pollutants he finds insufferable today.

30384 **APTIC NO. 51956**

Cuddihy, R. G., D. G. Brownstein, O. G. Raabe, and G. M. Kanapilly

RESPIRATORY TRACT DEPOSITION OF INHALED POLYDISPERSE AEROSOLS IN BEAGLE DOGS. *Aerosol Sci., 4(1):35-45, Jan. 1973. 15 refs.*

Respiratory tract deposition patterns were measured in five Beagle dogs following inhalation of lanthanum-140 labeled aerosols ranging in size distribution from 0.42 to 6.6 micron activity median aerodynamic diameter. Each dog was exposed to a series of aerosols within the above particle size range, and respiratory tract deposition patterns were assessed by radioactivity profile scanning for several days following inhalation. The aerosols were polydisperse with particle sizes which were satisfactorily described by log-normal distributions with geometric standard deviations ranging from 1.3 to 2.8. The fractions of the inhaled aerosols deposited in the nasopharyngeal, tracheobronchial and pulmonary regions of the respiratory tract were similar to calculated deposition fractions for humans using deposition fractions for single particle sizes from the Task Group on Lung Dynamics. The results indicate that the Beagle dog represents a satisfactory biological model for man in inhalation toxicity studies, especially with regard to the initial dose distribution. (Author abstract modified)

30385 **APTIC NO. 51876**

Fishman, Alfred P.

CHRONIC OBSTRUCTIVE LUNG DISEASE (C.O.L.D.). ***Preventive Medicine, 2(1):10-13, March 1973. 6 refs.***

Chronic obstructive lung disease has been sufficiently precise to spotlight a public health problem that is worldwide in scope and mammoth in its socio-economic and medical implications. The incidence of C.O.L.D. exceeds that of pulmonary neoplasm and acute respiratory failure, making it the major noninfectious cause of death and disability from lung disease. During 1972, approximately 15 million people manifested symptoms of C.O.L.D.; of these, 2.5 million will be restricted in their physical activities and more than 50,000 will die. The population explosion seems destined to continue, and the incidence of C.O.L.D. is expected to increase. Smoking and air pollution are the two chief offenders. Smoking is a major initiating agent for C.O.L.D. Air pollution is a common aggravating influence. After a few years of heavy smoking, the young person, usually a man, develops a bronchiolitis. Occupational air pollution will accelerate the process. In dealing with symptomatic C.O.L.D., medicine and physiology have been preoccupied with the advanced complications of a form of lung disease that might be preventable or reversible if detected early.

30386 **APTIC NO. 51960**

Fodor, Georg G., Donata Prajsnar and Hans Werner Schlipkoeter

ENDOGENEOUS CO FORMATION THROUGH INCORPORATED HALOGENATED HYDROCARBONS OF THE METHANE SERIES. *(Endogene CO-Bildung durch inkorporierte Halogenkohlenwasserstoffe der Methanreihe.) Text in German. Staub, Reinhaltung Luft, 33(6):258-259, June 1973. 5 refs.*

White rats were exposed to a mixture of carbon monoxide and methylene chloride (CH_2Cl_2) for a study of the synergystic effect of the two pollutants. The animals were exposed to 1000 ppm methylene chloride and to 100 ppm CO. After 3 hrs, the blood concentration for both substances was determined. Quite surprisingly, the carboxyhemoglobin concentration in the blood had risen to 20% which was twice as high as was expected for a CO concentration of 100 ppm. For confirmation of the assumption that this was due to an endogeneous CO formation caused by the presence of CH_2Cl_2, a new experiment series was started exposing white rats to normal air, to methylene chloride, to CO, and to a mixture of both. It could be confirmed that incorporation of methylene chloride causes endogeneous formation of CO. Methylene chloride vapors cause a harmful rise of the COHb level at inhalation of concentrations lower than the maximum allowable working place concentration for a period of 3 hr.

30387 **APTIC NO. 51899**

Fry, F. A. and A. Black

REGIONAL DEPOSITION AND CLEARANCE OF PARTICLES IN THE HUMAN NOSE. *Aerosol Sci., 4(2):113-124, March 1973. 15 refs.*

The sites of particle deposition and clearance rates in the human nose were investigated for inhaled monodisperse particles in the size range 2-10 micron. At least 35% of the retained material was deposited in the anterior region of the nasal passages, and the site of maximum deposition was 2-3 cm behind the tip of the nose. Although clearance of particles from this region was very variable, a long-term retention with a biological half-life greater than 3 hr was always observed. In approximately half the experiments, the site of maximum deposition in the nose was in the region of the junction between the ciliated and nonciliated epithelia; particles deposited on the ciliated epithelium were rapidly removed by the mucociliary clearance mechanism, while particles deposited in the unciliated region were removed relatively slowly. In some cases, as much as 60% of the particles initially deposited in the anterior region were removed with half-lives of less than 20 min. (Author abstract modified)

30388 **APTIC NO. 51740**

Gibbs, G. W., D. Allard, R. Gray, and A. Corsillo

CARBON MONOXIDE AND NITROGEN DIOXIDE EXPOSURE OF MONTREAL LONGSHOREMEN. *Can. J. Public Health (Toronto), 64(2):147-153, March/April 1973. 14 refs.*

The exposures of longshoremen to carbon monoxide from fork-lift trucks used in the holds of ships in Montreal were estimated as the carboxyhemoglobin content of a finger-prick sample of blood (% COHb). The median % COHb of nonsmokers increased from 0.6% on arrival at work to 2.0% (maximum 5%) after 2 hr in the hold, whereas smokers showed no demonstrable increase, probably because cigarettes were the major source of carbon monoxide. Carbon monoxide concentrations in holds occasionally exceeded 50 ppm and on one ship reached 300 ppm. Small amounts of nitrogen dioxide were detected when diesel motors were used. On the basis of % COHb in the blood of longshoremen and their present work routine, no serious hazard seemed to exist. The concentrations of carbon monoxide and nitrogen dioxide should be checked when trucks are operated in confined areas for prolonged periods. (Author abstract)

30389 **APTIC NO. 51777**

Gross, Paul, John M. G. Davis, Russell A. Harley, and Robert T. P. de Treville

LYMPHATIC TRANSPORT OF FIBROUS DUST FROM THE LUNGS. *J. Occup. Med., 15(3):186-189, March 1973. 13 refs.*

The concentrations of inhaled mineral dust and mineral fibers in the lungs and satellite lymph nodes of 30 persons were determined and tabulated. Fiber concentrations ranging from nearly 4 to more than 125 million/g of dry tissue were determined in satellite lymph nodes. Approximately 6% of all E M size fibers were identified as chrysotile asbestos. No correlation was established between fiber concentration in lymph nodes and lungs or between the fiber concentration in lymph nodes and concentration of mineral dust in either lung or lymph nodes. (Author summary modified)

30390 **APTIC NO. 52064**

Hasegawa, Norihiko and Reiko Ijichi

ANALYSIS OF MERCURY IN THE HAIR (I) EXAMINATION OF SAMPLE ADJUSTMENT AND CHANGES BY AGE GROUPS, AND COMPARISON BY JOB CLASSIFICATIONS. *(Mohatsuchu suigin no bunseki (I) Shiryo chosei no kento to nenreibetsu suii, shokushubetsu hikaku). Text in Japanese. Nagoya Daigaku Kankyo Igaku Kenkyusho Nenpo (Annu. Rep. Res. Inst. Environ. Med., Nagoya Univ.), vol. 24:205-208, March 1973. 5 refs.*

The measurements were taken of mercury content in the hair of six workers who handle 2 kg of mercury/day, twice a month for manufacturing flowmeters. These workers wear rubber or vinyl gloves and masks with activated carbon adsorbent. The ventilation of the workshop is also satisfactory. The mercury content in hair ranged from 2.2-8.0 micrograms/g of hair, compared to 32.0 micrograms/g of a mercury poisoned patient. There are some measurement equipment salesmen whose hair samples had as much as 20 micrograms/g accumulation, and whose mercury count in urine and blood were also high. These are examples of careless handling of mercury products because of infrequency of their coming into contact with mercury and their usual indirect contact with the products. It has been noted that workers in such places use vacuum cleaners in the workshop. This is nothing but redispersion of mercury particles in the air through the exhaust of the vacuum. The exhaust side has to be covered by activated carbon or some other means of prevention have to be taken against respray of mercury in the air.

30391 **APTIC NO. 52207**

Heyder, J., J. Gebhart, G. Heigwer, C. Roth, and W. Stahlhofen

EXPERIMENTAL STUDIES OF THE TOTAL DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT. *J. Aerosol Sci., 4(3):191-208, 1973. 22 refs.*

The deposition in the human respiratory tract of monodisperse airborne di-2-ethylhexyl sebacate droplets in the size range from 0.2-1 micron in diameter was studied for a 500 cu cm tidal volume and a 4 sec breathing cycle without respiratory pauses. Four male subjects served as volunteers in the breathin experiments. The calculation of deposition was based upon measurements of the number concentration of the aerosol particles and the respiratory flow rate at the mouth. No particle size of minimum deposition and no differences in the average deposition of the subjects was found provided the inhalations were initiated from the subjects normal functional residual capacities. The deposition in the above particle size range was about 0.1. (Author abstract)

30392 **APTIC NO. 52070**

Higgins, Ian T. T.

THE EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. *Preventive Medicine, 2(1):14-33, March 1973. 108 refs.*

Chronic bronchitis and emphysema, two chronic respiratory diseases (CRD), are discussed. Thirty to forty thousand people die each year in the U. S. from chronic respiratory diseases. During the early decades of this century death rates from CRD in the U. S. declined rapidly. They remained low during the 1930's and 1940's. But since 1949 there has been a steady rise in the death rates from emphysema. Factors related to CRD such as age, sex, socio-economic circumstances, heredity, smoking, air pollution, infection, and occupational exposures are discussed. Evidence from a wide variety of epidemiological investigations suggests that air pollution is a significant factor in CRD. There has been more doubt about the effect of lower, more sustained levels of pollution on respiratory disease. In London, daily concentrations of smoke and sulfur dioxide were fairly highly correlated with mortality and morbidity from all causes and from certain respiratory diseases from 1958 to about 1962. This study suggests that the maximal permissible annual concentrations of smoke or of SO2 should both be under 100 micrograms/cu m.

30393 **APTIC NO. 52149**

Holsgrove, P. M. and G. Kaine

MODERN TECHNOLOGY IN THE MEASUREMENT OF PHYSIOLOGICAL REACTIONS OF WORKERS IN INDUSTRY AND ITS PRACTICAL APPLICATION. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Metallurgical Society, p. 351-364, 1973. 5 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Metallurgical Society, 1973, Paper A73-25.)*

A computerized technique was developed to continuously monitor, record, and subsequently analyze pulse rates of aluminum smelter workers. A cardio-tachometer converts individual pulses to a heart rate expressed as beats/min. The rate is encoded for wire transmission and decoded at a computer terminal. It is then passed through an analog to digital converter and entered into the computer via a scanner. Computer programs provide information on acceleration, peak heart rates, recovery rates, and variations of pulse rate within a period of physical activity. This information is valuable when considering methods to reduce physiological stress. Currently, 20 reports are generated for each 8-hour test in addition to a graph of pulse rate versus time for each activity performed during the shift.

30394 **APTIC NO. 52346**

Ikeda, Yoshio, Shigetomo Horiuchi, Hamako Yoshimoto, and Toyozo Kaneko

STUDIES ON THE TOXICITY OF PCB. *(PCB no dokusei ni kansuru kenkyu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 18:51-54, March 1973.*

The chronic effect of PCB (polychlorinated biphenyls) on rats to the second generation was studied by administration of KC-400 (major constituent tetra-CB) at the level of 20, 100, and 500 ppm in feed. The body weights of the pregnant mice of the test group were the same as that of the control group, and the food intakes of the two groups were also the same. The same results were found for the pregnant mice of the second generation. There were slight increases of dead fetuses in the 100, 500 ppm group of the second generation and the 100 ppm group of the third generation. After 11 weeks of administration of KC-400, the 500 ppm group showed swelling stomachs compared to the other three groups.

30395 **APTIC NO. 52041**

James, William E., Clarence A. Maaske, and Cheryl Johnstone

CARDIAC PERFORMANCE IN GOATS RENDERED CHRONICALLY HYPOXEMIC BY CARBON MONOXIDE. *Preprint, Federation of American Societies for Experimental Biology, Washington, D. C., 12p., 1973. 4 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 57th Atlantic City, N. J., April 16, 1973.)*

Cardiac function was studied in six goats exposed for 2 wk to 160- 200 ppm carbon monoxide. Prior to exposure the goats were implanted with instrumentation for measuring left ventricle pressure, aortic blood velocity, stroke volume, and cardiac output, and with a catheter for obtaining arterial blood samples. All electronic signals were analyzed by a digital computer. No decrease in maximum velocity of concentration (V-max) of the cardiac muscle was observed during exposure, although mean carboxyhemoglobin saturation was 20.1%. Arterial pH, oxygen, and carbon dioxide tensions remained unchanged during CO exposure. These results indicate that arterial oxygen content is not the mediating factor which produces Vmax depression at an altitude of 4300 m. The Vmax and heart rate were depressed for 1 wk following CO exposure, suggesting that some physiological adjustment had occurred during exposure which did not become evident until the CO was removed.

30396 **APTIC NO. 52084**

Kato, Takashi

SPECIAL SERIES: POLLUTION AND HEALTH INJURY - METHODOLOGY FOR STUDY - EPIDEMIOLOGICAL APPROACH. *(Tokushu: kogai to kenko shogai, kenkyu hohoron, ekigakuteki apurochi). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):1923-1927, 1973. 5 refs.*

As an epidemiological approach to pollution and health impairment, checking into the following four factors are necessary: the factor exists at every occurrence of the same symptom of health damage; when the degree of the factor is more intense, the degree of health impairment is greater and more intense; when the factor is quantitatively greater, the health damage is also quantitatively greater, and if it diminishes or is eliminated, the health impairment is diminished or alleviated; the mechanism of the factor as the cause of the symptom can be biologically proven. As an example, the case of the health impairment of junior high school students in the area polluted by manganese factory is presented. The manganese particulate measurements in the polluted area are 20 times over the amount in other areas of the same city; but the total amount of settling particles and sulfur oxides in the area are the same as in other areas. The health conditions of students of the schools within a 500 m radius and a 5 km radius were compared. The rate of subjective morbidity symptoms and the second measurements of vital capacity showed significant differences in two schools. When dust collectors were installed in the factory in 1971, these symptoms and morbidity decreased among the students of the nearby school. It was also ascertained that those who lived closer to the factory had less vital capacity and more serious subjective symptoms.

30397 **APTIC NO. 51749**

Klevay, Leslie M.

HAIR AS A BIOPSY MATERIAL. III. ASSESSMENT OF ENVIRONMENTAL LEAD EXPOSURE. *Arch. Environ. Health, 26(4):169-172, April 1973. 28 refs.*

Lead was measured by atomic absorption spectrometry in the hair of a random sample of the population of the Republic of Panama. Age, sex, and place of residence were found to influence the lead concentration of hair. Lead concentration increased in a rural-urban gradient, with females having higher concentrations than males. Awareness of these factors will increase the utility of hair as a biopsy material in the assessment of environmental exposure. (Author abstract)

30398 **APTIC NO. 52130**

Kodama, Yasushi, E. Kunitake, K. Nobutomo, M. Urabe, T. Inamasu, and N. Ishinishi

STUDIES ON THE CONCENTRATION OF LEAD IN THE AIR AND IN HUMAN BLOOD (REPORT 1). *(Taiki chu namari nodo to kecchu namari ryo ni kansuru kenkyu (dai 1 po). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):92, April 1973.*

The relationship of blood lead levels to the lead content in the air was studied using 45 people living near a heavily traveled road in Fukuoka city for more than 3 years, 55 inhabitants of a neighboring quiet zone, 155 printing factory workers, 34 underground parking attendants, 16 electric appliance manufacturing workers, and 56 inhabitants in the Yaeyama islands. The respective blood lead levels were 11, 9.6, 10.9, 17.1, 13, and 15.5 micrograms/100 g. Air lead levels were 1.33-5.65, 0.09-1.27, 0.73-0.81, 1.06, 2.07, and 0.18-0.60 micrograms/cu m, respectively.

30399 **APTIC NO. 52465**

Kosmider, Stanislaw and Adam Misiewiez

EXPERIMENTAL AND EPIDEMIOLOGICAL INVESTIGATIONS ON THE EFFECT OF NITROGEN OXIDES ON LIPID METABOLISM. *Int. Arch. Arbeitsmed., 31(3):249-256, 1973. 12 refs.*

Experimental and epidemiological investigations were performed with the aim of elucidating whether chronic exposure to nitrogen oxides resulted in impaired lipid metabolism. In experiments on guinea pigs exposed for a period of 6 mo to 1 ppm of nitrogen oxides, a rise in the level of total lipids and cholesterol accompanied by a fall in the liver cholesterol content was found. Epidemiological investigations on human subjects chronically exposed to nitrogen oxides revealed a rise in the serum total lipid level accompanied by a rise in the level of beta and gamma- lipoproteins and a fall in alpha-lipoproteins. The results obtained may indicate that nitrogen oxides exert an arteriosclerotic effect. (Author abstract modified)

30400 **APTIC NO. 52201**

Kostial Krista, D. Kello, and G. H. Harrison

COMPARATIVE METABOLISM OF LEAD AND CALCIUM IN YOUNG AND ADULT RATS. *Int. Arch. Arbeitsmed., 31(2):159-161, 1973. 3 refs.*

The influence of age on the comparative metabolism of lead and calcium was studied by application of radioactive markers (Ca(47) and Pb(2O3)) orally or intraperitoneally to female rats aged 4 weeks and 4 months old. The body retention of both radioisotopes was determined over a period of 8 days. All retention values were higher in the younger animals. There were three to four times higher after oral administration and 1.3-1.7 times higher after intraperitoneal application. This indicates that the age related differences are very similar for lead and calcium and that they are mostly due to changes in intestinal absorption. (Author abstract modified)

30401 **APTIC NO. 52466**

Kozukue, Hiroyuki, S. Yoshiba, K. Shikano, K. Oshima, N. Takemura, K. Kudo, Y. Yamamura, S. Yamamura, and M. Yoshida

EXAMINATION OF PRIMARY AND MIDDLE SCHOOL BOYS AND GIRLS IN RELATION TO THE EFFECTS OF ENVIRONMENTAL POLLUTION BY LEAD. REPORT NO. 2. *(Namari ni yoru kankyo osen no eikyo ni kansuru sho-chu gakusei kenshin - dai 2 ho). Text in Japanese. Nippon Eiseigaku Zasshi(Japan. J. Hyg.), 28(1):94, April 1973. 1 ref.*

The effects of lead on 191 subjects was examined by studying coproporphyrin, porphobilinogen, lead, and delta-aminolevulinic acid in the urine and reticulocytes and basophillic punctate erythrocytes in the blood. The subjects were schoolchildren from Tokyo who had a history of various diseases such as eczema, dermatitis, bronchial asthma, bronchitis, colds, allergies, anemia, headaches, nausea, absenteeism, or delayed growth. Lead and delta-ALA in the urine was normal; 12.04% coproporphyrin was found in positive persons; no children had positive porphobilinogen; no children had reticulocyte counts over 10%; 9.24% had erythrocytes over 0.5%; and there was no clear relationship between these five parameters. The basophillic punctate erythrocytes did not have coarse basophillic granules which are typically seen in persons with lead poisoning, but did have the minute granules often seen in cases of eczema, drug rash, toxic dermatitis, and poisoning by chlorinated hydrocarbons. The frequency of basophillic punctate erythrocytes was not negligible, however. No lead poisoning symptoms were found; however, other results indicated the existence of complex environmental pollution.

30402 **APTIC NO. 52071**

Krain, Lawrence S.

WHY IS PANCREATIC CANCER INCIDENCE UP; STOMACH CANCER DOWN? Geriatrics, 28(4):140-145, April 1973.

A review of literature reveals that the age-adjusted mortality curves cross for pancreatic cancer (rising) and stomach cancer (declining). Occupational exposure and cigarette smoking could account for the decline in stomach cancer and rise in pancreatic cancer. This is because of the earlier ages of susceptibility of cigarette smokers and industrial chemical workers to pancreatic and lung cancer than to stomach cancer, leaving fewer susceptible people alive to contract stomach cancer. Both cancers occur chiefly in the lower socioeconomic classes and are related to urbanization. Comparisons between native-born and foreign-born in the United States indicate that both of these cancers are environmentally related. Further studies must control adequately for cigarette smoking and occupation before attempting to implicate less biologically plausible and statistically related factors such as air pollution. The study of the reciprocal relationship of pancreatic and gastric enzymes and secretory activity to various dietary, chemical and alcoholic stimuli is suggested as an area of future research in patients with pancreatic and gastric cancer. (Author summary)

30403 **APTIC NO. 52078**

Kumazawa, Yasumasa

PHOTOCHEMICAL SMOG, MAINLY ON THE SMOG IN OSAKA PREFECTURE. *(Kokagaku sumoggu-shuto shite osaka-fu no sumoggu ni tsuite). Text in Japanese. Farumashia (Pharmacy), 9(4):251-256, April 1973.*

Several photochemical smog incidents occurred in Osaka and Tokyo at several schools. Alert procedures were made more rigorous after the incidents were found to correlate with high oxidant concentrations. In 1971, about 1600 individuals complained of subjective symptoms probably caused by smog. Main causes of smog include nitrogen dioxide and hydrocarbons. Ozone and oxidants such as peroxyacetyl nitrate are also involved. Oxidants cause eye irritation; acrolein is a suspected oxidant. Photochemical smog symptoms include eye irritation, coughing, dyspnea, chest and throat aches, numbness in the extremities, and irritation of the mucosa. In the Osaka and Tokyo incidents, oxidant concentrations were not terribly high. Also, patients were primarily schoolchildren. The Osaka area now has a monitoring system which issues photochemical smog warnings.

30404 **APTIC NO. 52039**

Lapp, N. LeRoy

COAL WORKERS LUNG DISEASE. *Preprint, Federation of American Societies for Experimental Biology, Washington, D. C., 3p., 1973. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 57th, Atlantic City, N. J., April 16, 1973.)*

Approximately 130,000 working underground coal miners in the U. S. are currently at risk of developing Coal Workers Pneumoconiosis, which in its simple form is characterized by the presence of a coal dust deposit around small airways and focal emphysema. In about 1/10 of subjects with CWP, scar tissue develops which greatly distorts and obliterates the lung structure. This disturbance is known as complicated CWP or progressive massive fibrosis. Findings from an epidemiological study of nearly 10,000 working miners indicate that simple lung function tests, such as the forced expiratory volume in 1 sec (FEV 1.0), are not greatly affected by the presence of simple CWP. However, in miners with higher categories of simple CWP, significant over-inflation of the lungs was present in spite of normal FEV 1.0 values. The over-inflation appeared to be a direct consequence of CWP and was present in nonsmoking as well as smoking miners. Evidence of disease within small airways of miners with category 2 and 3 simple CWP whose lung function was normal was demonstrated by testing frequency dependence of dynamic compliance. A slight reduction in diffusing capacity was observed among miners whose X-rays showed simple CWP with the small opacities as compared with miners with larger opacities. Problems in applying lung function tests in large epidemiological studies are discussed.

30405 **APTIC NO. 51765**

Laurenzi, Gustave A.

THE MUCOCILIARY STREAM. *J. Occup. Med., 15(3):175-176, March 1973. 7 refs.*

The multiple determinants in the effectiveness of the mucociliary apparatus as a protective force in the respiratory tract are reviewed. Mucus constitutes the work load of the mucociliary system, and the movement of particles is directly related to the movement of the mucus on which particles are deposited. Flow properties are related to the viscoelastic behavior of mucus. Ciliary activity with respect to its role in protection against inhaled material is reviewed.

30406 **APTIC NO. 51859**

Leh, F. and K. M. Chan

SULFUR COMPOUNDS POLLUTION, HEALTH EFFECTS, AND BIOLOGICAL FUNCTION. *J. Chem. Educ., 50(4):246-247, April 1973. 8 refs.*

Sulfur and its compounds are essential to many facets of life processes. The presence of methionine, cysteine, and disulfide bonds in the protein is critical to the functioning of these proteins as enzymes and as structural units in all living cells. Lower molecular weight organic sulfur compounds, such as S-adenosylmethionine, lipoic acid, coenzyme A, glutathione, thiamine, and biotin, are essential for transmethylation, acetylation, carbon dioxide transfer, and maintenance of proper redox potentials in the cells. However, the increasing use of sulfur-containing fuels and general industrial expansion have led to an alarming quantity of sulfur in the environment. In many cases a poisonous sulfuric acid smog is formed by the oxidation of sulfur dioxide. The approximately 4000 deaths in the London air pollution episode of 1952 were probably due to the potential toxic properties of sulfuric acid. Present efforts should concentrate on reducing the atmospheric sulfur pollutants and achieving a natural sulfur balance in the ecosphere.

30407 **APTIC NO. 52457**

Levin, A. I. and L. M. Masalkova

PULMONARY CIRCULATION IN PATIENTS WITH CHRONIC DUST-INDUCED BRONCHITIS (ACCORDING TO RHEOGRAPHIC FINDINGS). *(Sostoyaniye legochnogo krovoobrashcheniya u bol nykh khronicheskim pylevym bronkhitom (po dannym reografticheskogo issledovaniya). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 5:12-15, 1973.*

Rheographic examination of the lungs was carried out in 113 patients suffering from chronic dust-induced bronchitis and in 30 healthy subjects. Most of the subjects examined demonstrated changes in the shape and temporal characteristics of the rheogram, which could be observed already at the stage of a moderately marked bronchitis and in the absence of clinical and roentgenological signs of pulmonary hypertension. The most salient changes on the pulmonary rheogram were found in patients with an asthmoid component. The disclosed changes in the shape and temporal characteristics of the rheogram, such as smoothness of the descending bend, lengthening of the presphygmic period and the sphygmic one, reduced rates of the blood inflation, all this points to the presence in such patients with chronic dust-induced bronchitis of a troubled pulmonary circulation, caused apparently by an increased angiopulmonary resistance and deranged contractility of the myocardium.

30408 **APTIC NO. 51871**

Lutov, V. A.

THE EFFECT OF PETROLEUM AEROSOLS WITHOUT ADDITIVES ON THE IMMUNOLOGICAL REACTIVITY OF THE ANIMAL ORGANISM. *(Vliyaniye aerozolya neftyanykh masel dez prisadok na immunologicheskuyu reaktivnost organizma zhivotnykh). Text in Russian. Gigiena i Sanit., no. 3:117-118, 1973. 8 refs.*

Changes in the immunological reactivity due to inhalation over 3 or 6 mo of 60, 30, or 12 mg/cu m concentrations of aerosols of spindle oil grade 3 and of industrial oil grade 45 were studied in rats. Dysproteinemia, reduction of the serum agglutinin titer and of the phagocytic activity of the leukocytes, and increase in the blood neuraminic acid level, and indicator for the inhibition of immunological reactions, were determined.

30409 **APTIC NO. 52318**

Michels, Sabine

THE BIOLOGICAL EFFECT OF VANADIUM WITH RESPECT TO A LIMITATION OF ITS EMISSION. *(Zur biologischen Wirkung von Vanadin im Hinblick auf eine Immissionsbegrenzung). Text in German. Staub, Reinhaltung Luft, 33(7):276-279, July 1973. 29 refs.*

Vanadium is found in hard coal which contains between 0.01 to 0.05% by weight referred to ash. In some mineral oils the vanadium concentration is considerable. Mineral oil from Venezuela contains about 130 ppm. At the combustion of V-containing fuel oil, vanadium gets into the soot in form of vanadium oxide. In oil-fired heaters as much as 50% V or 80% V2O5 may be found in the soot. In the waste gases of oil or hard coal-fired furnaces of industries, more than 0.5% V2O5 was measured. In 1958 more than 40% of the emission measurements yielded vanadium concentrations of more than 0.02 micrograms/cu m; in Northern England the annual average values in the years 1956 and 1958 measured 0.0011 and 0.0088 micrograms/cu m. In cities with high air pollution such as Liverpool and Leeds, concentrations of 0.0142 and 0.042 micrograms/cu m were measured. In Hamburg the annual average for 1961/62 was 0.076 micrograms/cu m, in Dortmund 0.145 micrograms/cu m. While the maximum allowable working place concentration is uniform for all industrial nations, the maximum allowable emission concentration differs. For Soviet Russia it is at presently 0.002 mg/cu m and in the Federal Republic of Germany a maximum allowable emission concentration of 0.001 mg V/cu m is under discussion.

30410 **APTIC NO. 52097**

Mikami, Riichiro and Shoji Kudo

ACUTE DAMAGES DUE TO PHOTOCHEMICAL SMOGS IN JAPAN: A CLUE FOR THE ANALYSIS OF CAUSATIVE MATERIAL. *(Wagakuni ni okeru iwayuru sumoggu ni yoru kyusei shogai: genin busshitsu kaimei e no itoguchi). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):2039-2047, 1973. 15 refs.*

The cases of acute photochemical smog effects in Japan between 1970 and 1972 were studied: the major symptoms, clinical observations, and analyses of material factors are discussed. The effects of photochemical smog are related with toxic chemical pollution. These chemical pollutants can be classified into the following categories: the primary stimulant material which causes irritation of upper respiratory passage but has no or little poisoning effect on the entire body even at the lethal dosage; the secondary irritant material which irritates skin, respiratory, and all mucous membranes and has the poisoning effect on the entire body; simple asphyxiation material which is biologically inactive; chemical asphyxiation material which has biological activity and asphyxiates the respiratory function; materials which affect the entire body by acting upon the nerves, on the inner organs such as the liver and the kidneys, or cardiac functions, or on the blood, or those material that enhance allergic susceptibility. It is important to note that photochemical smogs affect not only the respiratory system, but also the entire body; exercise increases pulmonary ventilation and the effects of pollutants. The findings are presented in tables.

30411 **APTIC NO. 52454**

Miyoshi, Yasuro, Fusa Izuchi, Tosuke Nakano, Koji Niiyama, and Muneo Wakabayashi

SCANNING ELECTRON MICROSCOPIC OBSERVATION OF TRACHEAL MUCOSA IN MICE EXPOSED TO NO2 AND SO2. *(SO2 narabini NO2 bakuro-go no mausu kikan nenmaku-johi no sosa kenbikyo-teki kansatsu). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho Esophagological Soc.), 24(1):1-8, 1973. 9 refs.*

Morphological changes on the epithelium of the tracheal mucosa of mice of the DS-strain which had been exposed continuously for 3 weeks to sulfur dioxide concentrations of 1.8-4.3 ppm and for 5 weeks to nitrogen dioxide concentration of 0.55-1.6 ppm were observed by means of scanning electron microscopy transparent-type electron microscopy, and ultrathin section technique in light microscopy. In the exposed group, the individual cilia became undistinguishable, shortened, adherent, thinner, and lost the directionality of the metachronal wave. The bulging of non-ciliated cells became conspicuous and showed a general state similar to the accentuation of mucosal secretion. The state was divided into the following consecutive four phases: the preparing phase in which microvilli became denser; the beginning phase in which microvilli became longer and secreted droplets were seen on the surface; the increasing phase in which the amount of secreted material increased and bulged on the surface with a shape of a mushroom; and the terminal phase in which the bulged material was released, leaving a caldera-like depression.

30412 **APTIC NO. 51764**

Myrvik, Quentin N.

THE ROLE OF THE ALVEOLAR MACROPHAGE. *J. Occup. Med., 15(3):190-193, March 1973. 8 refs.*

The immunologic function of alveolar macrophages in terms of their capacity to divide, adapt, mature, engage, and destroy parasites that invade the lower respiratory tract is reviewed. The status of normal alveolar macrophages, the nature of BCG-activated alveolar macrophages, the response to intratracheal and intravenous challenges, the effect of oxidant air pollutants, and the potential benefits and liabilities of cell-mediated responses were studied.

30413 **APTIC NO. 52083**

Nakajima, Taichi and Hajime Oda

SOURCE OF POLLUTION, ALLOWABLE STANDARDS, AND COUNTERMEASURES-- ENVIRONMENTAL STANDARDS FOR AIR POLLUTION AND THEIR MEDICAL BASIS. *(Kogai no hasseigen, kyoyo kijun to boshi taisaku--taiki osen ni kansuru kankyo kijunchi to sono igakuteki konkyo). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):1943-1949, June 1973. 13 refs.*

The medical bases for the determination and revision of maximum allowable standards for sulfur oxides, carbon monoxide, suspended particulates, nitrogen oxides, and photochemical oxidants are discussed. The original Feb. 12, 1969 standards were based on the epidemiological standpoint that the deterioration of patients symptoms due to high concentration of sulfur dioxide was not epidemiologically proven; the increase of mortality due to SO2 was not proven; the increase of morbidity of congestive respiratory diseases and undesirable reaction or impairment on the young people's respiratory functions due to SO2 increase had not been proven. The recommendations of the Council for Living Environment were met by strong opposition from industries, and the final bill was made much less stringent. Subsequent studies of the effects of SO2 in various parts of Japan proved that the morbidity of children in areas with 1.04 mg sulfur trioxide 100 sq cm/day was twice as much as that in areas with 0.53 mg SO3/100 sq cm; that the mortality of circulatory disease patients increased significantly during the period of 6 days when the average count of SO2 was 0.12 ppm; that the morbidity of new patients of congestive respiratory system and SO2 concentration over 0.04 ppm/hr/year average had a positive relationship. These and other epidemiological indications led to the revision of the standards to 0.04 ppm/hr for 24-hour average and 0.1 ppm/hr, on May 16, 1973. Similarly, the medical basis for each standard of environmental standards for other pollutants are presented.

30414 **APTIC NO. 51778**

Niden, Albert H.

PULMONARY SURFACTANT. *J. Occup. Med., 15(3):181-185, March 1973. 38 refs.*

The role of pulmonary surfactant in the pathogenesis of pulmonary diseases was studied. The major difficulty in assessing the proper role is the lack of a direct means of quantitatively measuring this complex. Lung compliance, surface activity of lung extracts, and measurements of pulmonary phospholipids, as indirect means for evaluation, are examined. With respect to the role of pulmonary surfactants in maintaining the normal pressure volume characteristics of the lung and diseases resulting from a significant deficiency in pulmonary surfactant activity, except for fetal immaturity there is no known disease state in which there is a primary deficiency of pulmonary surfactant. A secondary decrease in surfactant production and inhibition of activity, however, significantly affect the pathogenesis of various pulmonary diseases.

30415 **APTIC NO. 51730**

Nordman, Claes Henrik, Sven Hernberg, Jorma Nikkanen, and Aulis Ryhanen

BLOOD LEAD LEVELS AND ERYTHROCYTE DELTA-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY IN PEOPLE LIVING AROUND A SECONDARY LEAD SMELTER. *Work Environ. Health, vol. 10:19-25, 1973. 22 refs.*

The population living in the vicinity of a secondary lead smelter in southern Finland was randomly examined in 1970 for lead absorption. The blood-lead concentration (PbB) and the erythrocyte delta-aminolevulinic acid dehydratase activity (ALA-D) were used as parameters. In all, 293 inhabitants were examined. There was a statistically significant correlation between PbB and the distance of habitation from the emitting source, as well as between the PbB's and the monthly dust fall lead within the area. The rise in PbB when approaching the emitting source was accompanied by a decrease in the ALA-D activity. Although the correlation between ALA-D and the distance of habitation from the emitting source was weaker than that for PbB, ALA-D proved to be a useful test in the demonstration of even a low-grade increase in lead absorption. (Author abstract)

30416 **APTIC NO. 52455**

Oshima, Hidehiko

EFFECTS OF OXIDES OF SULFUR ON HUMAN BODIES. *(Io-sankabutsu no jintai eno eikyo). Text in Japanese. Gendai Igaku (Curr. Med.), 20(3):299-305, March 1973. 41 refs.*

The effects of air pollutants such as sulfur dioxide on humans relates to meteorological conditions, smoking, occupation, and other factors. Acute injury can result from an increase in smoke and SO2 combined with an inversion or lack of wind; such injuries include an increase in mortality rates in old people and infants due to respiratory and circulatory disorders. Chronic bronchitis and pulmonary emphysema are correlated to the concentration of SO2 and floating dust. A high correlation exists between the frequency of asthmatic paraoxysm and the SO2 concentration average in 1962. Morbidity is a sensitive index of the chronic effects of SO2 exposures. Laryngopharyngitis, colds, bronchitis, and bronchial asthma had a good correlation with SO2 concentrations in Yokkaichi in 1964; in 1970 the correlation of bronchial asthma was less significant, due to a decrease in SO2 concentrations. When SO2 coexists with dust and sulfuric acid mist, their multiplied action causes asthmatic paraoxysm in respiratory disease patients. Smog aggravates the respiratory or circulatory disorders of infants. Animal experiments showed that SO2 inhalation caused disturbances of the cilia, possibly resulting in increased bacterial infection; repeated SO2 and antigen inhalation increased antibody production, which possibly caused increased sensitization in the airways of asthma patients.

30417 **APTIC NO. 52456**

Penknovich, A. A., L. N. Chernova, and E. V. Gladkova

ALVEOLAR AIR AND ARTERIAL BLOOD GASES IN DUST-INDUCED AFFECTIONS OF THE RESPIRATORY ORGANS. *(Gazy al veolyarnogo vozdukha i arterial noy krovi pri pylevykh zabolevaniyakh. organov dykhaniya). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 5:15-19, 1973. 6 refs.*

A study of correlation between the partial oxygen and carbon dioxide tension in the alveolar air and the tension of these gases in the arterial blood of patients with pneumoconioses and chronic dust-induced bronchitis is presented. A substantial increase of the alveolar-arterial gradient of the oxygen was noted predominantly in well-marked functional troubles in the system of external respiration. In patients with initial stages of pulmonary insufficiency, the fall of the oxygen tension in the arterial blood comes mainly as a consequence of a relative alveolar hypoxia grown out of ventilation troubles. The presence of an arterial-alveolar gradient of carbon dioxide whose magnitude does not experience any essential changes depending upon the degree of respiratory insufficiency was revealed.

30418 **APTIC NO. 52051**

Petajan, Jack H. and John B. McCandless

EFFECT OF CARBON MONOXIDE ON SKELETAL MUSCLE. *Preprint, Federation of American Societies for Experimental Biology, Washington, D. C., 4p., 1973. 3 refs. (Presented at the Federation of American Societies for Experimental Biology, Annual Meeting, 57th, Atlantic City, N. J., April 16, 1973.)*

Gracilis anterior muscles from Sprague Dawley rats were used to determine muscle fatigue in vitro during exposure to hypoxia, carbon monoxide and hypoxia, and carbon monoxide and oxygen. Isometric muscle tension, defined as contraction at optimal length producing less than 2% shortening, was measured with a Strathan strain gauge. The presence of CO in the medium enhanced the development of fatigue. Tension fell to 24% of control level in the presence of hypoxia and to 7% of control level in the presence of hypoxia and CO. Ten minutes after the experimental period, muscles exposed to hypoxia alone had recovered to 88% of control tension, while those exposed to hypoxia and CO had recovered to only 39% of control tension. A decrement in tension and delayed recovery also occurred when the muscle was exposed to O2 and CO. Tetanic stimulation resulted in complete loss of tension and prolongation of recovery time when the muscle was exposed to hypoxia and CO. The effect of CO on twitch tension is most likely mediated by the influence of the gas on intracellular oxygen transport. The impaired recovery of tension in the presence of CO suggests the displacement of O2 from intracellular binding sites by CO. The duration of CO binding and the ability of O2 to displace CO apparently determine the persistence of long-term intoxication effects.

30419 **APTIC NO. 51803**

Plamenac, Pavle, Aleksandar Nikulin, and Branko Pikula

CYTOLOGIC CHANGES OF THE RESPIRATORY TRACT IN YOUNG ADULTS AS A CONSEQUENCE OF HIGH LEVELS OF AIR POLLUTION EXPOSURE. *Acta Cytol., 17(3):241-244, May-June 1973. 17 refs.*

The changes of the sputum respiratory epithelium in young people after several months exposure to Sarajevo air pollution in the absence of known factors which themselves can produce changes of the columnar epithelium were investigated. Eighty-three sputum specimens from 49 men and 34 women between 18 and 21 years of age were investigated cytologically. All sputum specimens were embedded in paraffin after fixation. Sections were cut and also tested for iron. Four slides were examined for each specimen. After several months of exposure to Sarajevo air pollution, 83.6% of the young people investigated produced a deep cough sputum with abnormal columnar cell findings. The possible causes of the high percentage of such findings are discussed.

30420 **APTIC NO. 52147**

Plotko, E. G., V. A. Kostyuchenko, and E. N. Panycheva

TOXICITY OF WEAKLY SOLUBLE FLUORIDES INTRODUCED BY INHALATION ROUTE. *(K voprosu o toksichnosti plokho rastvorimykh ftoridov pri ingalyatsionnom vozdeystvii). Text in Russian. Gigiena i Sanit., no. 4:14-16, 1973. 2 refs.*

The chronic toxicity of the weakly soluble fluoride cryolite was studied in albino rats that inhaled 3.1 and 0.5 mg/cu m concentrations of this substance for 6 hr a day over 5 months. Concentrations of 3 and 1 mg/cu m produced both general and specific toxic effects on the organism, with manifestations such as disturbances in motor chronaxy, tendency of decreased blood cholinesterase activity, reduced vitamin C level in the adrenal glands, inhibition of carbohydrate metabolism, increased fluorine concentration in the urine, accumulation of fluorine in teeth and bones, edema of the mucous membranes of the respiratory tract, eosinophilic leukocyte infiltration of the lung tissue with focal hemorrhages, granular distrophy of the liver and kidney cells, inflammation of the gastrointestinal tract, and corrugation of brain cells. Cryolite at a concentration of 0.5 mg/cu m was ineffective, and this level may be recommended as the maximum permissible concentration of weakly soluble fluorides in the air of industrial premises.

30421 **APTIC NO. 52319**

Robock, Klaus and Werner Klosterkoetter

STUDIES OF THE CYTOTOXICITY OF ASBESTOS DUSTS. *(Untersuchungen ueber die Zytotoxizitaet von Asbest-Staeuben). Text in German. Staub, Reinhaltung Luft, 33(7):279-282, July 1973. 10 refs.*

Cell tests with UICC-standard asbestos dusts showed, after application of the TTC method, the nigrosin method, and the polarographic method for determining cell breathing, that the serpentine asbestos had stronger cytotoxic effects than the amphibole asbestos. The same relation was found for the fibrogeneous behaviour in animal experiments with the intraperitoneal test. The strong cytotoxicity of the serpentine asbestos after dry grinding, by which the length of the fibers was reduced and the structure changed, and after annealing at temperatures of 600 C and 700 C, and the range of conversion into forsterite could be explained by a shifting of the pH-value of the suspension. By an increased solubility of magnesium ions, the pH-value of the dust/cell suspension is shifted into the alkaline range no longer compatible for the cells.

30422 **APTIC NO. 52085**

Shigematsu, Itsuzo

POLLUTION AND HEALTH INJURY - INTRODUCTION. *(Kogai to kenko shogai - josetsu). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):1918-1922, 1973.*

The definition of health impairment, precursor pathology, the cause and effect of pollution, and the present state of pollution and health are discussed. The object of scientific study should not be already apparent damages by pollution but the causes for environmental pollution and the degrees and the effects on the human body. Except for especially heavy concentration of pollution, pollutants are ordinarily found in small amounts, and the effects appear from the chronic effects over a prolonged period of time. This means that unless the signs of health impairment are discovered very early, the treatment will be too late by the time clinical symptoms appear to indicate the damage. Therefore, precursor pathology should be the basis of epidemiological study of pollution. Generally, a factor for a disease must meet two conditions: that the factor is found in the patient but is not found in others or only to an insignificant extent in others or healthy persons; that when this factor is given to a healthy person, the disease or symptom appears (not necessarily 100% of the time), and the absence of this factor causes no similar symptom. If the second condition is met to some extent, this factor may be one of the many factors. When the manifestation of the result of these factors depend on a prolonged period, no experiments, either by human beings or animals, will be possible.

30423 **APTIC NO. 52086**

Shigematsu, Itsuzo and Hiroshi Abe

POLLUTION AND MEDICINE. *(Kogai to igaku). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):2058-2065, 1973.*

The lack of epidemiological studies for pollution diseases is discussed. Pollution diseases seem to be fundamentally different from the symptoms caused by poisoning by the same materials in other circumstances than air or water pollution.

The results obtained by animal experiments on acute or chronic poisoning by these pollutants are also different from the pollution diseases occurring in the human environment. The clinical object of epidemiological studies should not be those who have been damaged irretrievably, but the still heavy population, whose health and welfare should be guarded. New parameters for forecasting and prevention of pollution diseases are desirable.

30424 APTIC NO. 52419

Shima, Shogo

ENVIRONMENTAL POLLUTION BY METALS AND HEALTH PROBLEMS. *(Kinzoku ni yoru kankyo-osen to kenko mondai). Text in Japanese. Gendai Igaku (Curr. Med.), 20(3):307-315, March 1973. 8 refs.*

Metals cause occupational and environmental pollution diseases. The effects of metals on old people, infants, and sick people are described. Suspended dust in Nagoya contains beryllium, vanadium, manganese, lead, cadmium, and many other metals. Amounts of metals in dusts, food, and human urine are listed.

30425 APTIC NO. 52126

Shinozaki, Yoshitsugu

RESPIRATORY SYMPTOMS AND MASS-EXAMINATION OF LUNG FUNCTIONS OF INFANTS. *(Yoji no kokyu shojo to shudan-hai-kino kensa). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 31(4):194-195, 1973.*

The effects of air pollution containing chlorine gas on the respiratory symptoms and lung function of 1458 5-year-olds was studied by a questionnaire and lung function tests. The percentage of boys with stridor paroxysm was 23.1 of those living in the factory region, 20.9 in a factory regions further from the factory from which chlorine was emitted, 10.2 in the center city, 10 in the outskirts, and 7.3 in the suburb. The regional difference was not clear for girls. Respiratory symptoms other than stridor paraoxysm, eye and nose irritation, and the effects of allergic histories, did not show as much regional difference as those found in 3-year-olds. The peak-flow value for boys in the nearest factory region was lower than that in the suburbs, notwithstanding body height; their values were lower as body height was lower. In girls there was no clear trend. The lung time capacity was lower in boys from the factory regions than in those from the suburbs and outskirts. The appearance of so-called closed injuries occurred in boys from the factory regions. Chlorine pollution caused respiratory symptoms and decreased lung function in the 5-year-olds.

30426 APTIC NO. 51821

Stynes, Dennis V., H. Cleary Stynes, Brian R. James, and James A. Ibers

REVERSIBLE BINDING OF NITRIC OXIDE AND CARBON MONOXIDE TO IRON PORPHYRINS. ASSESSMENT OF THE ROLE OF PROTEIN IN HEMOGLOBIN. *J. Am. Chem. Soc., 95(12):4087-4089, June 13, 1973. 20 refs.*

Preliminary results on the equilibrium constants for the reversible binding of nitric oxide and carbon monoxide to iron(II) protoporphrin IX and iron(II) tetraphenylporphrin in piperidine are presented. These data in conjunction with those reported for the hemoglobin system were used to assess the effect of protein on the heme reaction. Direct comparison of the equilibrium constants for NO and CO binding to the heme inside and outside of the protein environment suffers from differences in iron(II) coordination number and spin state which are difficult to assess, although estimates of thermodynamic contributions due to these differences can be made. The competition between NO and CO indicates a greater amount of the NO complex is formed initially than that expected from the separate amounts equilibrium constants, but on standing, the relative amounts of NO and CO complexes reach their expected equilibrium concentrations. These preliminary thermodynamic and kinetic measurements appear to provide the best example yet of a model system for a naturally occurring protein in terms of both structural similarity at the active site and undergoing an identical reaction with that occurring in the protein. Such systems provide the only direct means of assessing the role of the globin on the reactivity of the heme group.

30427 APTIC NO. 52029

Suzuki, Takeo

ENVIRONMENTAL HEALTH. *(Kankyo Hoken). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 3(5):27-35, May 1973. 2 refs.*

The recent environmental problems, problems presently increasing in importance, the effects of envirnoment on the human being, and WHO s environmental health projects are discussed. One of the increasing problems is the traceable amount of heavy metal in suspended particulates its relationship with cancer and high blood pressure. The metals which in excessive quantities cause cancer include iron, copper, manganese, magnesium, molybdenum, and zinc; traceable metal carcinogens are nickel, cadmium, and chromium. Those that are conjectured to be carcinogens but have not been proven are cobalt and lead; the role of selenium as a carcinogen is still unclear. The known traceable metals which have bad effects on cardiac and vascular functions are manganese, chromium, vanadium, cobalt, zinc, fluorine, selenium silicon, copper, cadmium, and arsenic. According to the recommendations of WHO, new criteria must be set for nitrogen oxides, polychlorinated biphenyls, nitrite, nitrate, nitrosoamine, manganese, noise, ultrasonic waves, tritium, krypton, and a few other compounds.

30428 APTIC NO. 52121

Takayama, Yoshio, Go Toba, Shigeru Funabashi, Masatsugu Kubo, Ryo Yoshida, Ken Motomiya, and Motoaki Adachi

EFFECTS OF AIR POLLUTION ON INFANTS VIEWED FROM ABSENCE RATES IN PRIMARY SCHOOLS. *(Gakudo kesseki jokyo kara mita taiki-osen no shoni ni oyobosu eikyo). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 31(4):195, 1973.*

School absence rates due to respiratory diseases were studied from April 1968 to March 1969 at several primary schools in three regions: highly polluted (sulfur dioxide concentration greater than or equal to 0.06 ppm); moderately polluted (SO2 equal to 0.03-0.06 ppm); and low polluted (SO2 less than 0.03 ppm). First, third, and sixth grade students were studied. Absence rates were higher in highly polluted regions than in low polluted regions. No difference was observed between ages in the same region. The respiratory disease absence rate monthly fluctuation showed a peak only in the highly polluted region in autumn when the SO2 rate peaked. Colds accounted for an average of six absences a year in the highly polluted region. A significant correlation occurred between the SO2 concentration and the monthly absence rates of third graders in the highly polluted region and the absence rates of all pupils.

30429 APTIC NO. 52276

Tanaka, Kiyoshi

STUDIES OF THE TRANSFORMATION OF THE BODY FUNCTIONS BY PCB. *(PCB ni yoru seitainaikino no henka ni kansuru kenkyu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 18:49-51, March 1973.*

Time to be anesthetized for 30-60 day old rats by intraperitoneum injection of 150 mg/kg of sodium hexobarbiturate was reduced up to 4/5 of the original time by oral administration of commercial PCB (polychlorinated biphenyls). Administration of 2 mg/kg of KC-300 (major constituent tri-CB) or 5 mg/kg of KC-400 (major constituent tetra-CB) during a period of 3 days approximately halved the time of anesthesia. Detection with induced potential showed that the effect of PCB on the nervous system occurred only when a large quantity of the chemical was administered. Sufficient amount of KC-400 and KC-500 (major constituent penta-CB) increased the cytochrome P-450 and p-nitrophenol o-dealkyl enzyme in liver up to 10 times. The PCB promoted the effect of female hormone.

30430 **APTIC NO. 51731**

Tola, Sakari

THE EFFECT OF BLOOD LEAD CONCENTRATION, AGE, SEX AND TIME OF EXPOSURE UPON ERYTHROCYTE DELTA-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY. *Work Environ. Health, vol. 10:26-35, 1973. 43 refs.*

Blood-lead concentrations (PbB) and erythrocyte delta-aminolevulinic acid dehydratase (ALA-D) activities were measured in 1370 workers (1199 men, 171 women) under different conditions of exposure to lead. A close negative correlation was observed between PbB and ALA-D in 1147 workers. The different lead exposure groups could be distinguished by the ALA-D activity to a high degree of probability when the grouping was made with PbB intervals of 20 micrograms/100 ml. At lead intervals of 10 micrograms/100 ml, the differences between the groups were statistically significant up to the 60-69 micrograms/100 ml PbB group. No difference was apparent between the ALA-D activities at the same blood-lead levels in men and women. At a given blood-lead level, the ALA-D activity was lower after less than 1 year s exposure than in exposures of longer duration. The ALA-D activity was higher in the age group of 24 years or younger than at more advanced ages at the same blood-lead levels. Measurements were made of the blood hemoglobin of 1269 workers, and a urinary ALA-D in 285 workers. The hemoglobin did not enable differentiation between blood-lead level groups, and did not display any correlation with PbB. A rise in the urinary ALA-D values was observed at PbB values of about 50 micrograms/100 ml blood, and the urinary ALA-D showed a statistically significant correlation with PbB and ALA-D. Thus, ALA-D was a reliable exposure test for lead over the whole range of absorption levels. Its main application appears to lie in population studies concerned with environmental health. (Author abstract)

30431 **APTIC NO. 52317**

Truhaut, R., C. Boudene, J. -M. Jouany, F. Tabuteau, and A. Bouant

ACUTE TOXICITY OF CARBON MONOXIDE AS MODIFIED BY ALIPHATIC HYDROCARBONS IN THE RABBIT. *(Modification de la toxicite aigue de l oxyde de carbone chez le lapin par la presence d hydrocarbures aliphatiques). Text in French. Eur. J. Toxicol. Hyg. Environ., 6(1):36-41, 1973. 7 refs.*

The modifying action of octane, isooctane, premium gasoline and motor vehicle exhaust gases on the acute toxicity of carbon monoxide was studied in rabbits by the physiographic method. The curarized animals were exposed to 2500 or 5000 ppm of CO, and 1000 to 5000 ppm of hydrocarbons for 60 min. The hydrocarbons aggravated the cardiovascular phenomena caused by CO (increased wave amplitude, bradycardia, and hypotension), while exhaust gas, behaving like a mixture of CO with hydrocarbons, facilitated recovery following CO poisoning, as did all the hydrocarbons studied. However, the hydrocarbons further degraded electroencephalogram activity. Both the hydrocarbons and the exhaust gas limited the increase in the venous and arterial carboxyhemoglobin levels due to CO, and also the differences between arterial and venous COHb.

30432 **APTIC NO. 52123**

Tsuchiya, Kenzaburo, M. Sugita, S. Seki, H. Yagyu, and M. Nagasaki

A DISCUSSION ON THE RESULTS OF A HEALTH EXAMINATION OF 3500 CITIZENS IN TOKYO IN RELATION TO LEAD. *(Tokyo tomin 3500 mei no namari kenshin kekka no kento). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):97, April 1973.*

The relationship between air lead levels in Tokyo in 1970 and 1971 and coproporphyrin, lead, and delta-aminolevulinic acid urine content and lead blood content was studied on 3500 Tokyo citizens. The average blood lead content was 13.1 + or 7.6 micrograms/ 100 g, the urine lead content was 12.4 + or 10.2 micrograms/100 g, the urine coproporphyrin content was 50 + or 39.7 micrograms/ l, and the urine delta-aminolevulinic acid content was 1.87 + or - 0.90 mg/l. The distance between the subject s residence and main streets, the period of residence, and the health factors were correlated. Only a weak correlation was found between the items. The blood lead content was lower than that of Americans and the increased lead exposure was very low.

30433 **APTIC NO. 52132**

Tsuchiya, Kenzaburo, Minoru Sugita, and Yoshitaka Kobayashi

THE EFFECTS OF LEAD IN THE AIR ON PRIMARY SCHOOL PUPILS. *(Taiki-chu namari no shogakko jido ni taisuru eikyo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):95, April 1973.*

The effects of lead in the air were studied on two groups of 4th and 5th graders chosen randomly from two primary schools, one in a polluted region of Yokohama, and another in a rural region. Lead, delta-aminolevulinic acid, and coproporphyrin in the urine were determined once every two months from Sept. 1970 to Sept. 1971. Lead in dust fall was also measured. The values of delta-ALA and coproporphyrin showed clear personal differences. Delta-ALA was significantly higher in pupils from Yokohama; coproporphyrin values were significantly higher in pupils from the rural area. The amount of lead in the settling dust was clearly larger in the city than in the rural region. There was a higher correlation between delta-ALA and coproporphyrin. No correlation was found between the amount of fallen lead and amounts of delta-ALA and coproporphyrin.

30434 **APTIC NO. 52082**

Tsunetoshi, Yoshizo, Tomokazu Okumura, Miyoko Ueda, Noriko Nakayama, Yasuhiro Takemura, Minoru Tsuda, and Akiko Sakamoto

SYMPTOMS AND DIAGNOSES - AIR POLLUTION. *(Shoko oyobi shindan - taiki osen). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):2008-2016, 1973. 44 refs.*

The diseases legally recognized as related with air pollution are medically analyzed and examined. Acute symptoms which have been complained of by victims of air pollution, chronic symptoms and descriptions, bronchial asthma, chronic bronchitis, asthmatic bronchitis, and emphysema are discussed. The problems of health aspects of air pollution are discussed. There are no clear-cut clinical symptoms particular to air pollution. Air pollution health damages could not be pinpointed to those on membranes coming into direct contact with the outside air, such as eyes, ears, nose, and the respiratory system. The damage of air pollution is not limited to the increases in morbidity or mortality, but in many other functional damages and biological or physiological irregularities which do not manifest themselves. The question of air pollution damages cannot be regarded as same as industrial or occupational hygiene, which is limited to particular age groups, particular areas, and sporadic exposure of 8 hr/day to the same pollutants. Air pollution is a continuous 24-hour exposure over a long period of time. Those who react strongly to pollutants, while the majority of people show no particular physical discomfort, are special allergic cases. Those who react strongly are cases of enhanced susceptibility and should be regarded as one kind of index for air pollution.

30435 **APTIC NO. 51839**

Yokoyama, Eiji

THE OBSTRUCTION OF SMALL AIRWAYS, TECHNIQUES FUNCTIONALLY TO DETECT IT--ITS SIGNIFICANCE IN THE FIELD OF ENVIRONMENTAL HEALTH. *(Massho kido no heisoku to sono kenshutsuho--kankyo eisei ni okeru sono igi no kento). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 15(2):127-137, 1973. 54 refs.*

A number of gaseous and particulate pollutants in the atmosphere primarily affect the small airways in the lungs, possibily causing insidious development of airway obstruction. Early, partial obstruction cannot be detected by such routine methods for ventilatory capacity as spirometry and respiratory resistance measurement. Recent research to develop techniques sufficient to detect functionally small airway obstruction is reviewed together with the application of the techniques in the field of environmental health.

30436 **APTIC NO. 52081**

Yokoyama, Eiji

POLLUTION AND HEALTH INJURY: AIR POLLUTION AND THE LUNGS. *(Kogai to kenko shogai: taiki osen to hai). Text in Japanese. Nippon Rinsho (Japan Clin.), 31(6):2033-2038, June 1973. 52 refs.*

The small airways of the lungs and air pollution, the effects of smoking on the small airways, the deterioration of airway susceptibility resistance by oxidants, air pollution and alpha-antitrypsin, oxidant and endurance, and the changes in function by pollutant gases by the presence of other particles are discussed. The studies of photochemical smogs have indicated the damages in the central and small airways of the lungs. Small airways are, as have been described, a quiet zone, where the pulmonary resistance comprises only 1% of the total lung resistance, and consequently, clinical irregularities and congestive symptoms are not apparent until their functions are very much damaged. Therefore, morphophysiological studies of how the functions deteriorate slowly and how to detect them early are still some of the problems. There is no data for the former at the present time, and the latter is being studied clinically by the frequency dependence of lung compliance, the maximum exhalation flow curve, and the closing volume of exhalation. The lungs are defended by the cilia functions and lung major phagocytes, and air pollutants such as oxidants and nitrogen oxides are known to impair the functions of both.

30437 **APTIC NO. 51944**

Zwemer, R. J. and J. Karibo

USE OF LAMINAR CONTROL DEVICE AS ADJUNCT TO STANDARD ENVIRONMENTAL CONTROL MEASURES IN SYMPTOMATIC ASTHMATIC CHILDREN. *Ann. Allergy, 31(6):284-290, June 1973. 10 refs.*

A clean air headboard system which removes all particulates of 0.5 micron and larger from the breathing zone of allergic individuals was tested in a double-blind study of 18 asthmatic children. The system consists of a blower mounted in a small floor cabinet that draws air from the surrounding area and pumps it through a high-efficiency particulate air filter to the headboard. High-velocity air jets at the outer edges of the system provide a contamination-free zone extending approximately 2 ft from the headboard. The children had received specific hyposensitization, ordinary environment control practices, and symptomatic medications other than steroids, and were still symptomatic. The purified air system resulted in a reduction of wheezing and coughing, and allowed more restful sleep with fewer interruptions due to symptoms. Daytime symptoms and school absenteeism were also reduced. Several children were also able to reduce the amount of medication necessary to control symptoms.

1972

30438 **APTIC NO. 52028**

Miyagi Prefectural Government, Sendai (Japan),
Environmental Protection Bureau

DATA ON ENVIRONMENTAL POLLUTION IN MIYAGI PREFECTURE. NO. 9. *(Miyagi-ken Kogai Shiryo - dai 9-ho). Text in Japanese. 568p., Dec. 1972.*

The amount of settling particles and sulfur oxides are monitored at 26 locations of Miyagi Prefecture, SOx by the lead dioxide and electroconductivity methods. The total settling particles this year averaged at 7.3 tons/sq km/mo compared to 5.0 tons/sq km/mo last year. However, the transition since 1965 shows a great improvement over the last 5 years. The total SOx this year was 0.30 mg/100 sq cm/day by the lead dioxide method compared to 0.36 mg last year. The blood lead, blood weight, and blood images were examined for some residents of busy traffic areas in Ishimaki city, and the health condition of schoolchildren in one city and one township were checked. Of the 20 samplings of the blood, the lead content averaged at 22.4 micrograms/100 cu cm of blood for men, and 18.6 micrograms/100 cu cm for women. The maximum figure was 30.0 micrograms 100 cu cm and the minimum was 8.8 micrograms/100 cu cm. These are still far below the maximum allowable lead blood content of 60 micrograms/100 cu cm. The children of Matsushima township and Tagajo city had no significant physical differences in general, except for the noticeable and significant number of children with less than 3.6 million erythrocytes among the children of Tagajo. There was no child with less than 3.6 million erythrocytes in the Matsushima group. There was no significant 0differences between two schools with regard to the children s health records or the form of heating at school or home. However, there was a significant number of children who reported soot in their home environment.

30439 **APTIC NO. 52262**

Alvares, Alvito P., Susan Leigh, Jonathan Cohn, and Attallah Kappas

LEAD AND METHYL MERCURY: EFFECTS OF ACUTE EXPOSURE ON CYTOCHROME P-450 AND THE MIXED FUNCTION OXIDASE SYSTEM IN THE LIVER. *J. Exp. Med., vol. 135:1406-1409, 1972. 17 refs.*

The rat liver mixed function oxidase system which is responsible for the metabolism of endogenous and exogenous compounds is affected by lead and methyl mercury. Administration of these environmental pollutants to rats results in a decrease in cytochrome P-450 content and inhibition of in vitro N-demethylase and hydroxylase activities. The in vitro enzyme inhibition effects of the metals found pharmacological expression in the whole animal by prolongation of hexobarbital-induced sleeping times.

30440 **APTIC NO. 52193**

Ashbel, S. I.

INTERRELATIONSHIP OF PNEUMOCONIOSIS WITH CHRONIC DUST-INDUCED BRONCHITIS. *(O vzaimosvyazy pnevmokoniozov i khronicheskogo pylevogo bronkhita). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 5:1-6, 1972. 23 refs.*

A review of studies on pneumoconiosis and dust-induced chronic bronchitis substantiated the thesis according to which pneumoconiosis and chronic dust-induced bronchitis appear as different forms in the course of a single occupational, dust induced disease of the bronchopulmonary system. These forms of disease develop in workers of the same occupations, under the influence of the same dust and other concomitant occupational factors, and are essentially similar in their pathomorphology, being modifications of pneumosclerosis. Pneumoconiosis and chronic dust-induced bronchitis develop in conjunction or are superimposed upon one another. Chronic bronchitis is regarded as clinical manifestation of pneumosclerosis. Chronic bronchitis is always accompanied by more or less pronounced lesions of the lung interstitial tissue and pneumosclerosis. Bronchitis and bronchiolitis were detected in all cases of dust lung and silicosis.

30441 **APTIC NO. 51813**

Basu, P. K.

AIR POLLUTION AND THE EYE. *Surv. Ophthalmol., 17(2):78-93, 1972. 71 refs.*

Air pollutants can be classified as those emitted directly from known sources and those produced in the air from primary pollutants. Primary pollutants include particulates, radioactive compounds, and compounds of sulfur, nitrogen, carbon, and halogens. When sunlight acts on nitric oxide, nitrogen dioxide, and hydrocarbons, photochemical smog, containing ozone and peroxyacetyl nitrates, is formed. Another major type of smog is characterized by a buildup of sulfur dioxide and particulates from the burning of fossil fuels. A correlation between high levels of air pollution and health problems has been established, but the effects of prolonged periods of lower air pollution levels is harder to determine. Observations of the association of pulmonary diseases with certain geographical areas provides much of the evidence for the harmful effects of ordinary air pollution levels. Not only does air pollution cause reduction in visibility, sometimes severe enough to cause accidents, but it has direct adverse effects on the eyes as well. Secondary pollutants found in photochemical smog are especially harmful to the eyes. Ozone is not an important eye irritant, but it may contribute synergistically to eye irritation. Formaldehyde, acrolein, peroxyacetyl nitrate, and peroxybenzoyl nitrate are significant irritants. Thy type of smog characterized by sulfur dioxide and particulates has not been directly related to eye irritation. Much of the research on the effects of air pollution on health has been concerned with the pulmonary system; some of this can be applied to the eyes, however, due to the fact that both the respiratory system and the eyes have mucous membranes.

30442 **APTIC NO. 51951**

Coffin, D. L. and D. E. Gardner

INTERACTION OF BIOLOGICAL AGENTS AND CHEMICAL AIR POLLUTANTS. *Ann. Occupational Hyg., 15(2/4):219-234, 1972. 31 refs.*

The interaction of ozone and infectious microorganisms is discussed on the basis of a series of experiments in which mice were exposed to Streptococcus (Group C) aerosol before or after ozone exposure. The parameters through which the interaction was determined included rate of bacterial kill, multiplication, and invasiveness as well as the enhancement of mortality. Pulmonary defense mechanisms studied included chemotaxis, mobilization or suppression of macrophages, phagocytic capacity of macrophages, alteration of intracellular enzymes, and other factors affecting macrophage function and host resistance. The results suggest that the action of ozone is mediated through alterations in the macrophage system, including reductions in macrophage number, phagocytic function, and lysosomal activity. The effect of ozone is manifested within a short time after the introduction of bacteria and not only inhibits the clearance rate but permits uncontrolled growth of the pathogenic organisms producing pneumonia and septicemia. Ozone exposure is also destructive to benzopyrene hydroxylase activity, and enzyme of microsomal origin. This suggests that ozone is significant in the transport and degradation of various reactive chemicals. While tolerance can protect against ozone concentrations sufficient to cause edema and death, this phenomena does not protect against cytologic effects likely to affect specific antibacterial forces. The role of an infective model system in toxicological appraisal is discussed. The dose-response effect of ozone on aveolar microphages is mentioned.

30443 **APTIC NO. 51838**

Creasia, Donald A., P. Nettesheim, and Anna S. Hammons

IMPAIRMENT OF THE LUNG CLEARANCE MECHANISM BY RESPIRATORY INFECTION. *Health Phys., 23(6):865-867, Dec. 1972. 4 refs.*

To determine the effect of respiratory infection on deep lung clearance, specific-pathogen-free mice were inoculated instranasally with influenza virus. Seven days later the mice were given an intratracheal injection of 10 micrograms of (51) chromium oxide particulates. The defect in particle clearance first became noticeable 6 days after injection of (51)Cr2O3, i.e., 13 days after infection. At 3 months, six infected animals retained 45-60% of the initial lung burden and the seventh retained 25%. Uninfected control mice retained only 8% of the initially deposited radioactivity. For the five most heavily affected animals, more than 84 days were required to eliminate 50% of the radioactive particles, as compared with 12 days for the controls. Individuals with respiratory infections and possibily other respiratory disorders may accumulate markedly higher levels of particulates than their nondiseased counterparts, especially when the inhaled material is slowly solubilized in body fluids.

30444 **APTIC NO. 52264**

Fletcher, E. C.

A NOMOGRAM FOR THE TRANFER FACTOR FOR CARBON MONOXIDE IN THE LUNGS. *Thorax, 27(3):382-385, 1972. 2 refs.*

A nomogram was designed to facilitate determination of the total lung transfer factor for carbon monoxide from experimental data obtained by the single breath method using a resparameter. Results of one slide rule calculation and one nomogram procedure are given, and these are compared with a computer calculation. Duplicate measurements for the transfer factor for CO were made in 50 patients, and from each of these measurements the transfer factor was derived by three methods. The nomogram was found to give a quick and reliable estimate of the transfer factor, and this could be made immediately after the test.

30445 **APTIC NO. 51807**

Holloway, R., S. Chetty, and P. Moodley

NET AND GROSS LUNG FAILURE AMONG PATIENTS SENT FOR PULMONARY FUNCTION TESTING. *S. African Med. J. (Capetown), 46(14):404-408, April 1, 1972. 35 refs.*

In investigating whether a useful purpose could be served by classifying patients thought to have lung failure into those with a wide alveolar to arterial oxygen gradient (net lung failure), and those with underventilation (gross lung failure), the blood gases of 107 patients were measured. The presence of a widened alveolar to arterial oxygen gradient was the commonest disturbance, occurring in 86% of the patients, whereas alveolar hypoventilation was found in only 15%. After a widened alveolar to arterial oxygen gradient, the most common disturbance was hyperventilation, found in 42%. This system of classification might be useful, since it directs attention to the underlying disturbance. The undue stress laid on hypoventilation is misleading -- hyperventilation and a widened alveolar to arterial oxygen gradient are more commonly encountered. (Author summary modified)

30446 **APTIC NO. 52308**

Kimura, Masami and Noriko Otaki

PERCUTANEOUS ABSORPTION OF CADMIUM IN RABBIT AND HAIRLESS MOUSE. *Ind. Health (Japan), 10(1-2):7-10, Aug. 1972. 9 refs.*

The absorption of cadmium through the skin of rabbits and hairless mice was represented by the accumulation in the liver and kidney. The accumulated amounts of cadmium in both organs of rabbits were 0.4-0.6% for the cadmium applied on the back skin for 5 weeks. The amounts in both organs of hairless mice were 0.2-0.8% for cadmium on the back skin for 1 and 2 weeks. (Author abstract)

30447 **APTIC NO. 52372**

Moon, Richard B. and John H. Richards

NUCLEAR MAGNETIC RESONANCE STUDIES OF 13CO BINDING TO VARIOUS HEME GLOBINS. *J. Am. Chem. Soc., 94(14):5093-5095, July 12, 1972. 6 refs.*

The binding of (13)C enriched carbon monoxide to a variety of heme globins was studied by Fourier transform spectrometry. The heme globins studied were sperm whale myoglobin, adult human globin, fetal human hemoglobin, mouse hemoglobin, and rabbit hemoglobin. All carboxyhemoglobins showed two distinct nuclear magnetic resonances of equal intensity originating from CO bound either to alpha or beta subunits. The differences between the two resonances were not significantly affected over the pH range 6.5-7.5 and, at least in the case of rabbit HbCO, were not affected by 2,3-diphosphoglycerate. The ease of displacement of CO by oxygen differed markedly for CO bound to the alpha or beta subunits of rabbit hemoglobin.

30448 **APTIC NO. 52103**

Okamura, Shun

INHABITANTS OF POLLUTED AREAS AND THEIR CONSCIOUSNESS - FROM THE QUESTIONNAIRE ON CONSCIOUSNESS FOR POLLUTION FOR CITIZENS OF TSURUMI. *(Osen chuki ni okeru jumin to sono ishiki--Tsurumi-ku jumin no kogai ishiki chosa kara). Text in Japanese. In: Data on Pollution, No. 34-Environmental Protection Bureau, Yokohama City--Special Series City Environment and Biological Index. Yokohama Municipal Office (Japan), Environmental Protection Bureau, p. 42-48, April 1972.*

The 1970 annual average/hr of sulfur oxides in the Tsurumi district of Yokohama was 0.053 ppm. When health examinations were given for the first time to the residents in March 1971, one in 10 residents had chronic bronchitis, bronchial asthma, and other congestive respiratory diseases. A questionnaire was given to 515 residents above 40 years of age, who had resided in the area for more than three years. The recovery rate was 89.71%. The greatest source of complaints was air pollution, for 40.69% of the people, followed by 12.55% for noise, and 12.12% for odor. Those who felt the effects of air pollution were as high as 41.82% in the coastal industrial area, 34.25% in the tidewater area, and 27.15% in the Piedmont area. Some of common subjective symptoms were headache, general deterioration of health, frequent respiratory diseases of children, rhinitis, distended bronchi, eye irritation, tonsilitis or adenoid operations for the children, nose problems, sputum, cough, continuous coughing, susceptibility to cold and prolonged illness, wheezing, infant asthma which was reduced after moving away from the area, and discomfort of the throat which was eliminated when away from home on business trips.

30449 **APTIC NO. 51767**

Paiva, Manuel and Irina Paiva-Veretennicoff

STOCHASTIC SIMULATION OF THE GAS DIFFUSION IN THE AIR PHASE OF THE HUMAN LUNG. *Bull. Math. Biophys., 34(4):457-466, Dec. 1972. 9 refs.*

The transport of gases in the lung can be considered in two zones, the zone where mass transport occurs predominantly by convection and the diffusion zone. The solution of diffusion equation in the gas phase of the lung is very difficult because of the structure of the bronchial tree. The diffusion equation can be reduced to a simple one-dimensional form by means of physical arguments. The solution is then obtained by a stochastic simulation, which is easily realized on a digital computer. (Author abstract modified)

30450 **APTIC NO. 52017**

Rabinovitz, Sheldon Harold

THE UPTAKE OF MERCURY IN THE BRAIN OF GERBILS CHRONICALLY EXPOSED TO MERCURY VAPOR AND TO MERCURIC NITRATE. *Wayne State Univ., Detroit, Mich., Dept. of Physiology and Pharmacology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972. 98p. 54 refs.*

A chronic inhalation study was undertaken to compare the equilibrium concentrations of mercury in the brains of animals exposed to equal concentrations of mercury vapor and mercuric nitrate aerosol. One group of 12 gerbils was exposed for up to 2 mo to 0.5 mg of gaseous Hg/cu m of air. They were exposed for 90 min/day for 5 days/wk. Another group of 12 gerbils was exposed in an identical manner to an aerosol of 0.5 mg/cu m of mercuric nitrate. Three animals from each group were sacrificed every 2 wk in order to determine the concentration of mercury in brain, liver, kidney, and blood. After 6 wk of exposure, the concentrations of mercury in the four organs analyzed were plotted against duration of exposure. The kidney was the organ of highest concentration, while the blood contained the lowest concentration of mercury. Except for the brain, there was no statistical difference in the concentrations of Hg in the organs of the animals exposed to the aerosol from the concentration of Hg in the organs of the animals exposed to the vapor. After 2 wk of exposure, the brains of the vapor-exposed animals contained 10 times more Hg than the brains of the aerosol exposed animals. This difference was statistically significant. After 6 wk, the average concentration of Hg in the brains of the animals exposed to Hg vapor was 0.76 mg/g of tissue versus 0.04 mg/g of tissue in the brains of the animals exposed to the aerosol. These values represented equilibrium concentrations at this level of exposure. A mechanism based on the blood-brain barrier was proposed to explain the difference in uptake rates of mercury by the brain. At a chronic level of exposure, inhalation of mercury vapor was more toxic than inhalation of an equal dose of a mercuric nitrate aerosol. (Author summary modified)

30451 **APTIC NO. 51957**

Riihimaki, Vesa

CADMIUM, OCCURRENCE AND EFFECTS. *Work Environ. Health, 9(3):91- 101, 1972. 63 refs.*

The literature on the sources of cadmium pollution, cadmium levels in ambient air, drinking water, food, and tobacco, and acute and chronic effects of cadmium are reviewed. There is increasing interest in the ecology and health effects of cadmium, especially since cadmium was recognized as a causative agent in the etiology of the Itai-itai disease in Japan. This disease is essentially an osteomalacia which occurred in elderly women; nearly all patients had kidney injury. Human exposure to cadmium is primarily through food, and if cadmium intake in food doubles every 20 years, kidney cortex concentrations in 50-year- old Americans may approach the critical level of 200 ppm wet weight by the year 2000. The margin of safety between present safe levels of cadmium intake and critical levels is quite narrow, so every effort should be made to reduce cadmium contamination. A matter of even more immediate concern are the present Threshold Limit Values of cadmium in workroom air: 0.1 mg/cu m for fumes and 0.2 mg/cu m for dusts. A calculation based on the kinetics of cadmium reveals that continuous occupational exposure to 50 micrograms/cu m would lead to renal cortex cadmium concentrations of 200 ppm wet weight within 10 years. That the presently acceptable concentrations in workroom air may result in a similar situation after much shorter exposure has been proved by industrial exposure.

30452 **APTIC NO. 52219**

Shubik, Philippe

CURRENT STATUS OF CHEMICAL CARCINOGENESIS. *Proc. Natl. Acad. Sci. U. S., 69(4):1052-1055, April 1972. 17 refs.*

The prevention of cancer by the elimination of, or decreased contact with chemical carcinogens is discussed including: exposure of special groups, including occupational cancer and iatronic cancer; exposure of whole populations; and discovery of chemical carcinogens in the course of toxicity studies. Well-established occupational carcinogens include the aromatic-amine bladder carcinogens, 2-naphtylamine, benzidine, and 4-aminobiphenyl. Thorotrast, chlornaphazin, and stilbestrol have been implicated as iatrogenic carcinogenesis. Coal tar products used for road paving may be incriminated in some lung cancers in England, aflatoxins in primary liver cancer in Africa, and aflaxtoxins, nitrosamines, and polycylic aromatic hydrocarbons in carcinoma of the esophagus in Iran. It is important that a major effort be made to interrelate findings in man with those in the laboratory. Closer collaboration between the epidemiologist and the laboratory researcher will result in the design of better experiments by both. Advances in analytical chemistry and in biological test methods can lead to improved control of carcinogenic hazards. Clinical and preventive medicine, public health, environmental protection, and laboratory research must be combined to achieve practical control. (Author abstract modified)

30453 **APTIC NO. 52292**

Sterling, Theodor D.

DIFFICULTIES OF MEASURING THE EFFECTS OF AIR POLLUTION VS. THE EFFECTS OF SMOKING. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 22p., 1972. 33 refs. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

The assessment of the effects of pollutants and smoking on health is beset by many technical problems and hindered by the secrecy that surrounds much crucial data. On the technical level, existing evidence appears to be derived from many inadequate studies. By and large, studies of the effects of pollutants are so designed that they tend to underplay the effects of industrial pollutants or air pollutants on health while studies of the effects of smoking are so designed that they overestimate the effects of smoking on health. A more serious hindrance than these technical flaws is the lack of access to much of the crucial information that is needed to form valid conclusions. Almost all parties involved in these areas of investigation--industry, private agencies, and government research centers--have been guilty of withholding data from concerned scientists. In the light of these problems, it is difficult to just any but the most tentative conclusions concerning the relative role of pollution and smoking. (Author abstract modified)

30454 **APTIC NO. 51879**

Suzuki, Hideyoshi

AN EXPERIMENTAL STUDY ON PHYSIOLOGICAL FUNCTIONS OF THE AUTONOMIC NERVOUS SYSTEM OF MAN EXPOSED TO ACETONE GAS. *(Aseton gasu bakuru no jiritsu shinkeikei kino no oyobosu eikyo ni kansuru jikkenteki kenkyu). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 2(3):147-164, March 1972. 44 refs.*

Variations of physiological functions of the autonomic nervous system evoked by exposure to 250-270 or 500-750 ppm acetone gas for 6 hr were detected polygraphically. The subjects were 24 healthy male students who were divided into low concentration, high concentration, and control groups. Spontaneous variations and evoked variations in response to 1 or 30 sec auditory and visual incitements by the Sound and Photo Stimulator for EEG (electroencephalogram) were observed before and throughout the experiment. Spontaneous galvanic skin reflex (GSR) after repeated stimuli decreased in the gas groups, while evoked GSR with repeated 30 sec stimuli increased in the 250-270 ppm group. The evoked GSR with repeated 1 sec stimuli and latent time of the reaction showed no difference between the three groups. Vasoconstrictive reaction and latent time of the reaction to stimuli and patterns of the photoelectric finger plethysmogram were similar for all groups. Heart beat period lengthened in the control group and shortened in the high concentration group, respiration period did not differ between groups. Cerebral activity, as shown by occipital EEGs, rose in the gas groups in comparison with the control group. The variations in physiological functions induced by exposure to acetone gas tended to correlate with air temperature and cerebral activity. These findings indicate that the maximum allowable concentration of acetone gas should be lowered to below 250 ppm.

30455 **APTIC NO. 52080**

Suzuki, Yasuo, Sachiko Suzuki, Yasushi Kawasaki, Hiroshi Yonemaru, Kazuo Kobayashi, and Masuo Tobe

TOXICITY OF CARBON MONOXIDE. *(Issanka-tanso no dokusei). Text in Japanese. Toho Igakkaishi (J. Med. Soc. Toho, Japan), 19(6):644-649, Dec. 1972. 5 refs.*

Male mice of the dd strain were exposed to 0-0.9 v/v % carbon monoxide for 360 min. Convulsions leading to respiratory arrest occurred. Marked individual differences were observed in survival time. In the first experiment the minimum survival time was 94 min, the maximum was 618 min, the average was 360.4 + or 128.70 min; in the second experiment, the minimum was 105 min, the maximum was 483 min, the average was 282.2 + or 99.77 min. Male rats of the Wistar strain had paralytic status leading to respiratory arrest without any convulsions and shorter survival time with less individual differences than mice exposed to the same CO concentrations. Hearts increased in weight due to congestion in acutely poisoned mice. Cytochrom C injected into mice prior to CO exposure had no noticeable effect on survival time. A 7% aqueous solution of sodium bicarbonate injected into mice prior to exposure shortened the survival time at 1.0 ml/10 g b.w. and prolonged survival time at 0.03 ml/10 g b.w.

30456 **APTIC NO. 51835**

Thomas, Orville C. and John P. McGovern

AIR POLLUTION AND RESPIRATORY ALLERGIC DISEASE. *Southern Med. J., 65(12):1453-1458, Dec. 1972. 20 refs. (Presented at the Southern Medical Association, Section on Allergy, Annual Meeting, 65th, Miami Beach, Fla., Nov. 1-4, 1971.)*

Deaths attributed to polluted air are not caused directly by the exposure to pollution, but by preexisting diseases and conditions aggravated by the pollutants. The two major forms of air pollution are sulfur oxides in combination with solid particulates, and photochemical smog, produced by the interaction of hydrocarbon vapors, nitrogen oxides, and sunlight. Automobiles produce almost half of all air pollution in the United States; other sources include space heating, power utilities, industrial processing and manufacturing, and refuse disposal. Carbon monoxide poisoning can cause death and disability; small doses impair the ability to estimate short intervals of time, and may be partially responsible for some automobile accidents. By blocking the long-wave heat radiation from the Earth with carbon dioxide and by shielding the Earth from solar energy with particulates, air pollution is simultaneously heating and cooling the Earth. Inversions, in which pollutants collect in a limited space and are not mixed and diluted, occur in most major cities. Studies with animals have shown that some gases are not only toxic in themselves, but can also increase susceptibility to bacterial infection. In addition, experiments indicate that the effect of two or more pollutants may be multiplicative, rather than additive. Asthma and other pulmonary problems may be seriously aggravated by present air pollution levels. In response to this, physicians should be particularly conscious of the relationship between air pollution and health.

30457 **APTIC NO. 51927**

Waldbott, George L.

AIR POLLUTANTS AS A CAUSE OF CONDITIONS WHICH STIMULATE ALLERGIC RESPIRATORY DISEASE. *Ann. Allergy, 30(8):460-463, Aug. 1972. 8 refs.*

Based on their pattern of deposition, respiratory pollutants fall into five groups: pulmonary irritants, fibrosis-producing agents, granulomatogenics, fever-producing pollutants, and allergenics. The principal pulmonary irritants are sulfur oxides, nitrogen oxides, ozone, chlorine, and ammonia. Fibrosis-producing agents are quartz, silica, carbon, asbestos, and iron oxides. Granulomatogenics include beryllium and zirconium. Fever-producing agents are most metals in large concentrations and Teflon (pyrolyzed). Allergenics are thiocyanate, cobalt, formaldehyde, and methylamines. Allergic asthma can be caused by allergenic pollutants, which have a tendency to sensitize a person. In allergic asthmatics, attacks may be precipitated by gaseous or particulate pollutants because of their mechanical irritation or their caustic effect on the mucuous lining of the bronchial tree. No allergic mechanism need be involved. In nonallergic individuals, air pollutants can produce bronchospasm, cough, wheezing, and dyspnea which mimic allergic asthma without the immunological mechanism characteristics of allergic asthma.

30458 **APTIC NO. 52229**

Whitlock, James P., Jr., Herbert L. Cooper, and Harry V. Gelboin

ARYL HYDROCARBON (BENZOPYRENE) HYDROXYLASE IS STIMULATED IN HUMAN LYMPHOCYTES BY MITOGENS AND BENZ(A)ANTHRACENE. *Science, 177(4049):618-619, Aug. 18, 1972. 27 refs.*

The level of inducibility of aryl hydrocarbon hydroxylase (AHH) in resting and mitogen-stimulated human lymphocytes was studied by measuring the fluorescence of AHH-catalyzed phenolic products. Cells treated with phytoghemagglutinin or pokeweed mitogen (PWM) exhibited a twofold increase in AHH activity and a greater sensitivity to AHH induction by benz(a)anthracene. Enzyme activity in mitogen-treated cells exposed to benz(a)anthracene was three to eight-fold greater than in resting cells treated with benz(a)anthracene. The enzyme had characteristics typical of microsomal mixed-function oxidases: a requirement for nicotinamide adenine dinucleotide phosphate; inhibition by carbon monoxide, suggesting an involvement of P-450 hemoprotein; and inhibition by 7,8-benzoflavone. Investigation of AHH in humans may be useful in reducing the toxic or carcinogenic effects of exposure to certain environmental compounds.

30459 **APTIC NO. 51920**

Yeh, H. C.

USE OF A HEAT TRANSFER ANALOGY FOR THE MATHEMATICAL MODEL OF RESPIRATION TRACT DEPOSITION. *In: Annual Report of the Fission Product Inhalation Program. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., p. 310-314, Nov. 1972. 9 refs.*

NTIS: LF-45

Mathematical mdoels, predicting the aerosol deposition in the respiratory tract, are reviewed. A new approach to a mathematical model of respiratory tract deposition, based on the analogy of the heat and mass transfer, is described and discussed. The effect of curvature of the air pipes is considered on the air flow in the trachea and major bronchi. Mathematical data indicate that the air flow in the trachea and bronchi may not be laminar. (Author abstract modified)

30460 **APTIC NO. 52217**

Zuskin, E. and F. Valic

CHANGES IN FLOW-VOLUME CURVES WITH EXPOSURE TO ACTIVE VEGETABLE DUST. *Acta Med. Iugoslavica, 26(3):189-199, 1972. 13 refs.*

The method of measurement of the maximum flow-volume curve and of the lung volume curve in comparison with other tests of the ventilatory function is investigated. The measurement of the maximum flow-volume and of the simultaneous lung volume permits the reading of the air flow speed during expiration with any part of the vital capacity. The study was carried out on workers exposed to the action of active hemp dust which is known to cause an acute change of the lung ventilatory function during a working shift. The group investigated included 40 female non-smokers. The mean age of the female workers was 36 years and the mean duration of exposure 12 years. Byssinosis was diagnosed on the basis of the symptoms of chest constriction, cough, loud or difficult breathing during exposure to the dust. The results obtained have confirmed the hypothesis.

30461 **APTIC NO. 51844**

Zweiman, Burton, Raymond G. Slavin, Richard J. Feinberg, C. J. Falliers, and T. H. Aaron

EFFECTS OF AIR POLLUTION ON ASTHMA: A REVIEW. *J. Allergy Clin. Immunol., 50(5):505-514, 1972. 51 refs.*

Most of the data on the possible effects of air pollution on allergic respiratory disease are epidemiologic without strong evidence for pathogenetic mechanisms. However, three findings cannot be ignored. Episodes of acutely increased levels of sulfur dioxide and particulates are associated with increased morbidity and mortality from chronic obstructive bronchopulmonary disease; this is more apparent in older patients. Chronic exposures to relatively high SO2 concentrations are associated with increased morbidity from chronic bronchopulmonary disease in adults and increased respiratory infection in infants. High nitrogen oxide levels have also been associated with increased pulmonary infection in young children. There appears to be an additive element in the combination of cigarette smoking and high air pollution levels leading to adverse effects. Data from less common inhalational exposure studies do not confirm precisely with epidemiologic findings, possibly because of methodology used, acute versus chronic exposures, and differences between experimental and natural air pollutant patterns. Additional human exposure studies are needed to assay the effects of pollutants at three loci: in the upper airways and major bronchi, the smaller airways, and the alveoli.

1971

30462 **APTIC NO. 52231**

Cassell, Eric J., Michael D. Lebowitz, Doris W. Wolter, and James R. McCarroll

HEALTH AND THE URBAN ENVIRONMENT: IX: THE CONCEPT OF THE MULTIPLEX INDEPENDENT VARIABLE. *Am. J. Public Health, 61(12):2348- 2353, Dec. 1971. 7 refs.*

The relationship between air pollutants and health has been obscured in methodologically sophisticated studies based on closed-system mechanistic models in which a single cause is ascribed to a single disease. The concept of the multiplex variable satisfies some of the defects in present thinking. A multiplex variable is seen as a cause, which though it may be made up of conceptually discrete parts, acts as a whole in terms of its effects. Multiplex variables are characterized by several features: The effect of the whole is greater than the sum of its parts; The relationship of the parts to each other is not fixed; The manner in which the relationships of the parts vary is not fixed; Time is one of the parts. Because of these characteristics, a multiplex independent variable cannot be represented by one of its parts. The effect of the multiplex variable on health is best studied in terms of its health effects, not its component parts. The problem of the relationships of the parts of a multiplex variable to each other is separate and distinct from the problem of the relationship of the variable itself to health. The use of this approach is illustrated by analysis of the correlations between colds, weather variables, and pollution variables.

30463 **APTIC NO. 52374**

Stopps, G. J.

IS THERE A SAFE LEVEL OF LEAD EXPOSURE? J. Wash. Acad. Sci., 61(2):103-109, June 1971.

Lead exposure from natural and anthropogenic sources is discussed. As society gradually raised its standards for deciding what was an acceptable risk, it becomes more and more important to refine the tools used in measuring the risk and of factors associated with it. This is illustrated in which the number of cases of milk lead poisoning are correlated with the level of lead in the air of the part of factory in which they worked. In the highest exposure area, over 50% of the men are suffering from the early signs of lead poisoning. The level of lead in the air was directly related to the sickness rate. Cases of plumbism among battery workers in areas having different lead exposures have been studied. In considering the safety of any particular level of lead, one must be alert to the possibility that three are groups of persons in the population who are more sensitive to the effects of lead than most people.

1969

30464 **APTIC NO. 51909**

Konigsberg, Alvin Stuart

A STUDY OF THE MEASUREMENT OF OZONE AND SOME EFFECTS OF OZONE AND NITROGEN OXIDES ON THE ACTIVITY OF RATS. *Syracuse Univ., N. Y., Dept. of Physics. Thesis (Ph.D.), Ann Arbor, Mica., Univ. Microfilms, Inc., Jan. 1969, 102p. 102 refs.*

The effects of ozone and nitrogen oxides on man, animals, and plants were investigated with respect to the physical and chemical properties, origins of O3 and NOx in the atmosphere, synergistic effects, experimental results of animal tests, and methods of measurement and detection. The emphasis was on the effects of O3 containing Nox on gross motor activity and related parameters in rats. Rats were exposed to concentrations of O3 or O3 and NOx of between 5-100 pphm O3 or O3 equivalent. The differences between activity levels because of concentration effects were quite evident. An increase in O3 level increased the tendency toward more periods of quiescence, i.e., decreased motor activity. Exposure of the rats to O3 and NOx also increased the tendency of the rats to urinate. Only indirect effects on the nervous system were determined. Instrumentation and experimental equipment for the O3 and NOx exposures are discussed.

1967

30465 **APTIC NO. 52014**

Andriese, Paul Calvin

SOME EFFECTS OF ARTIFICIALLY GENERATED AIR IONS ON THE FREE-LIVING AMOEBA HARTMANNELLA RHYSODES SINGH. *California Univ., Berkeley, Dept. of Zoology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc, Sept. 8, 1967. 162p. 114 refs.*

A system for the exposure of agar-surface supported amoebas to artificially generated air ions and the effects of their interaction are described. Methods and equipment are described for the critical control of air movement, plate surface temperature, extraneous electrical fields, and humidity. Constant monitoring of ion currents was provided. A specific ion generator is described whose flexibility of application is exemplified by its ability to produce selected levels over a full range of ion densities. Studies of the migration characteristics of amoebas (Hartmannella rhysodes Singh) over an agar surface were conducted. Procedures and equipment required for routine demonstration of the formed tracks were developed. These methods and equipment appear to be the key to routine track visualization. Details of the formed tracks were demonstrated by a new resin method of microreplication. Microreplication suggests that small persistent psuedopodia are directly involved in locomotion on an agar surface. The concurrent development of the equipment for environment control, the investigations on migration characteristics, and the preliminary investigations on the exposure of amoebas to increased levels of air ions, established the selection of condition variations for subsequent ion exposures. Alteration of the migration rates of amoebas was selected as the indicator of physiological changes. Limitations and advantages of the system are discussed. Results of the exposure of amoebas to excess positive air ions showed rate changes that varied from zero response to a 29% reduction. (Author summary modified)

30466 **APTIC NO. 51916**

Mill, Raymond Allen

AIR POLLUTION FROM THE GRAIN INDUSTRY; AN ANALYSIS OF THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE INCIDENCE OF ASTHMA. *Minnesota Univ., Minneapolis, Dept. of Health Sciences. Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1967, 160p. 43 refs.*

The possibility of an allergenic response from materials associated with grain processing activities and the influence of environmental pollutants from the grain industry on the incidence of asthma was investigated. The chemical and physical parameters of the atmosphere were characterized and the relationship of these to asthma incidence was determined. The accuracy of environmental measurements were considered, and comparisons of environmental factors among themselves and with asthma attack rates were discussed in detail. The theoretical concepts and the materials and methods used in the investigations were discussed. Meteorological parameters included temperature by location and altitude, wind speed, wind direction, barometric pressure, relative humidity, and rainfall. Air pollution measurements were made by analyzing smoke spot samples, high-volume samples and the particle size distribution. The soiling index and the incidence of sulfur dioxide were also studied.

1961

30467 **APTIC NO. 52008**

Milly, George Harwood

METEOROLOGICAL ASPECTS IN THE ANALYSIS OF COMMUNITY AIR POLLUTION AS A FACTOR IN LUNG CANCER AND OTHER DEGENERATIVE DISEASES. *Michigan Univ., Ann Arbor, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1961, 267p. 172 refs.*

The purpose of this study is to review the subject of lung cancer as related to air pollution, and to provide additional techniques for elucidating the apparently complex relations involved. A meteorological analysis is conducted in an effort to develop methods for improving estimates of air pollution exposures. Air pollution climatology is reviewed to determine which kinds of meteorological observations currently appear most useful for the estimation of the behavior and diffusion of pollutants emitted into the atmosphere, and more particularly in the computation of concentration and dosage fields resulting from various geometries is presented. The analysis includes the influence of several meteorological factors on the dosage distribution. Techniques are derived for estimating pollution exposures when only pollution efflux rates (source strengths) and climatological data are available. A series of correlations is made between various estimators of pollution exposure and lung cancer mortality rates for a number of metropolitan areas of the United States, in order to illustrate the application of air pollution climatology to the analysis of disease data. Smoking, carcinogens, urban pollution, and other factors are mentioned.

EFFECTS-PLANTS AND LIVESTOCK

1973

30468 **APTIC NO. 51744**

Abe, Tomosaburo

THE BEHAVIORS OF SEA WATER FOAM AND SALT PARTICLES AND DAMAGES BY SALT. *(Kaisui homatsu oyobi kaien ryushi no kyodo to engai). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), no. 2:12-20, 1973. 6 refs.*

Sea water foam which contains salts was believed to be responsible for the damage to electric cables and injuries of trees and crops. The salt content in air depends largely on the wind velocity. One particular example showed that at wind velocity of 4.5 m/sec, the air contained 4 mg/cu m of salts, while at 27 m/sec the salt concentration increased to 100 mg/cu m. The chloride concentration in air of a seashore area at low wind velocity was about 2 to 20 mg/l, which was almost 100 times that in air several hundred miles off the seashore.

30469 **APTIC NO. 52312**

Abeles, Fred B. and Howard E. Heggestad

ETHYLENE: AN URBAN AIR POLLUTANT. *J. Air Pollution Control Assoc., 23(6): 517-521, June 1973. 23 refs.*

Ethylene was established as a toxic air pollutant with respect to plants based on criteria of dose-response curves, phytotoxic levels, damage to urban vegetation, and removal of phytotoxicants by air purification systems. The effects of ethylene on plants were studied in exposure chambers, and data on plant growth and damage were correlated with field data on vegetative damage and ethylene concentrations and sources in urban areas. The major source was determined to be automobile exhaust, thus establishing phytotoxic levels of ethylene over wide areas. The threshold effects for ethylene on plants started at 10 ppb, half-maximal effects occurred at 100-500 ppb, and saturation occurred at 1000-10,000 ppb. Plants were significantly damaged at levels of 25 ppb and greater.

30470 **APTIC NO. 52135**

Fujiwara, Takashi

DAMAGE TO PLANTS BY COMPLEX POLLUTION OF THE ATMOSPHERE. *(Taiki no fukugo oxen ni yoru shokubutsu no higai). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):233-236, June 1973. 19 refs.*

Plant damage caused by secondary pollutants such as peroxyacetyl nitrate or ozone are discussed. Several pollutants can cause a different effect on plants than an individual pollutant acting alone, these include sulfur dioxide plus ozone, SO2 plus nitrogen dioxide, NO2 plus O3, SO2 and NO2 plus O3, PAN or SO2 plus fluorides, O3 plus fluorides, and hydrocarbons plus SO2, NO2, or O3. There are additive, more than additive, or less than additive effects of coexistance. The specific effects of the synergistic action of two or more pollutants include necrosis and discoloration. In the case of SO2 acting in conjunction with O3, the lowest concentrations causing damage are 0.12/0, 0.1/0.01, and 0.05/0.05 ppm/ppm on green peas; no damage appeared at 0.1/less than 0.2; slight damage occurred at 0.2/0.1-0.2 ppm/ppm; and the addition of more O3 gave no more damage. The effect of SO2 and O3 on radishes was additive or less than additive; the effect of SO2 and O3 on Satsuma oranges was additive.

30471 **APTIC NO. 51770**

Haghiri, F.

ABSORPTION AND UPTAKE OF CADMIUM BY PLANTS. *Ohio Rep., 68(3):72-74, May-June 1973.*

A series of greenhouse experiments were conducted to determine cadmium absorption by plants via foliar and root systems and its translocation into the seed, vegetative growth, and Cd concentration of crops as influenced by soil-applied Cd, and the relative uptake of Cd by various vegetable crops. The effect of soil-applied Cd at varying rates on the dry matter yield and Cd concentration of soybean and wheat tops is shown. In both crops, as the level of applied Cd increased, the Cd concentration of plant tops increased and yield decreased. At the lowest level of soil-applied cadmium, 2.5 ppm, the toxicity of Cd in both soybeans and wheat began to cause a marked decrease in the total dry matter produced. The concentration of Cd in the vegetable crops studied varied considerably depending on the plant series. Highest Cd concentration was found in lettuce while, the lowest concentrations occurred in green pepper and radish roots. The toxic level of Cd for humans is 3 mg.

30472 **APTIC NO. 52344**

Hanan, Joe J.

ETHYLENE DOSAGES IN DENVER AND MARKETABILITY OF CUT-FLOWERS CARNATIONS. *J. Air Pollution Control Assoc., 23(6):522-524, June 1973. 8 refs.*

Ethylene dosages required to reduce the keeping life of cut-flower carnations were compared with dosages estimated from air samples of the atmosphere in the Denver metropolitan area. Ethylene concentrations sufficiently high and prolonged to reduce significantly flower longevity prior to final sale were rare. Damage was likely, however, after the flowers were purchased and displayed at room temperature.

30473 **APTIC NO. 51801**

Hasel, K.

THE FOREST IN INDUSTRIAL SOCIETY. *(Der Wald in der Industriegesellschaft). Text in German. Umschau (Frankfurt), 73(13):400-402, 1973. 7 refs.*

Forests are endangered by the increase of cities and industries and by the effects of air pollution. The importance of forests as a material resource is described. Because forests live so long they are exposed to the toxic air pollutants for a long time. In the Ruhr area a forest spanning more than 30,000 hectare has been damaged by waste gases and dusts. Coniferous trees are more affected. Injured trees must be often cut down 20 to 40 years ahead of time. Sometimes an entire species of tree is extinguished.

30474 **APTIC NO. 52043**

Lesley, J. W. and O. Clifton Taylor

TEMPERATURE AND AIR POLLUTION EFFECTS ON EARLY FRUIT PRODUCTION OF F1 TOMATO HYBRIDS. *Calif. Agr., 27(7):13-14, Feb. 1973.*

Atmospheric pollution may have been to blame for a decline in early fruit setting of tomatoes at Riverside, California. From June 12, 1971 to August 31, 1971, the level of total oxidants in the air was sufficient to injure susceptible plants. Accelerated senescence of the foliage and sunburn of the fruit, symptoms of oxidant injury, occurred. Hybrids formed by crossing VF6, VF36, and VFN8 varieties with an inbred line were in general superior to their parent varieties in early fruit production. It seems probable, though not certain due to the lack of controls, that the fruit yield was affected by very high air pollution oxidant levels early in the flowering season.

30475 **APTIC NO. 52213**

Linzon, S. N., W. D. McIlveen, and P. J. Temple

SULPHUR DIOXIDE INJURY TO VEGETATION IN THE VICINTY OF A SULPHITE PULP AND PAPER MILL. *Water, Air, Soil Pollut., 2(1):129-134, March 1973. 5 refs.*

Vegetation injury caused by sulfur dioxide emissions from a sulfite pulp and paper mill located in Ontario is described. Acute vegetation injury caused by SO2 was correlated with increased levels of sulfur within injured vegetation, meteorological data, and air sampling records of SO2 monitored by a continuous recorder located adjacent to the vegetation injury zone. The symptoms of injury observed on plants within the injury zone were described, and the relative sensitivity to SO2 was determined for 75 plant species in the area. (Author abstract)

30476 **APTIC NO. 52209**

Loetschert, W. and H. -J. Koehm

TREE BARK AS INDICATOR OF AIR POLLUTANTS. *(Baumborke als Anzeiger von Luftverschmutzungen). Text in German. Umschau (Frankfurt), 73(13):403-404, 1973. 3 refs.*

In the industrial area of Frankfurt, West Germany, the bark of deciduous trees acts as a useful indicator of air pollution. With increasing distance from the city, the Ph values of the bark increase and the sulfur content of the bark decreases. A linear dependence exists between sulfur content and pH value. The pH value of bark fluctates between 2.7 and 4.35; the sulfur content fluctuates between 0 and 250 micrograms/sq cm. The tilia platyphyllos, the acer plantanoides, and the fraxinus excelsior were found suitable as test trees.

30477 **APTIC NO. 51790**

Ma, Te-Hsiu, Djoko Isbandi, Shaukat H. Khan, and Ya-Shiu Tseng

LOW LEVEL OF SO2 ENHANCED CHROMATID ABERRATIONS IN TRADESCANTIA POLLEN TUBES AND SEASONAL VARIATION OF THE ABERRATION RATES. *Mutat. Res., 21(2):93-100, April 1973. 10 refs.*

Pollen tube cultures of the herb Tradescantia paludosa Anders. Sax clone-3 were grown on microslides coated with lactose agar medium (0.02% colchicine). They were incubated in an air-tight moist chamber for 18 hr to obtain the metaphase chromosomes of the pollen tube generative nuclei. Sulfur dioxide treatments were applied at the beginning of the germination stage, 7-10 min after sowing the pollen. A total of about 0.075 ppm of SO2 was used for the entire incubation period. Sulfur dioxide was either generated by the reaction between K2S2O5 and hydrogen chloride inside the chamber or obtained from diluting the gas from commercial SO2 gas of known concentration through a gas dilution system. Full-grown cultures fixed in Gate s fluid and stained in Feulgen were made into permanent slides for aberration-rate determination. Year-round study of SO2 effect on chromosomes was made possible by using a GRO-LUX lamp (Sylvania) illuminated incubator, in winter, to promote mitotic activity of pollen culture. In these studies, SO2 enhanced chromatid aberration rates (average 46 breaks/100 cells) in the cultures grown from field or hot-house plants during three consecutive summers (1970-1972). There was a gradual decrease in the fall and gradual increase in spring in both background and enhanced aberration rates. When summer pollen cultures from GRO-LUX lamp pre-conditioned (7-20 days) plants were treated with SO2 in the same chamber with those grown from summer hot-house plants, high rate (42 breaks/100 cells) of aberration was observed only in cultures from summer hot-house plants. (Author summary modified)

30478 **APTIC NO. 52136**

Matsuoka, Yoshihiro

SEVERAL FACTORS ON THE APPEARANCE OF PLANT DAMAGE BY AIR POLLUTION. *(Taikiosen no yoru shokubutsu no higai hatsugen ni oyobosu kakushu yoin). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):234-240, June 1973. 25 refs.*

Damage to plants caused by air pollution is discussed. The phytotoxicity of pesticides, susceptibility of plants, and environmental factors such as weather and soil conditions are mentioned. Susceptibility is species specific, for instance, it is varied in different species affected by sulfur dioxide. Species specificity is related to morphological structure, function of enzymes, and physiological reaction. The susceptibility of a plant to one pollutant does not mean it is susceptible to another pollutant. The environmental factors such as light, temperature, and moisture affect the damage caused by air pollutants. Generally, as humidity increases, so does damage. Soil moisture, nutrients, texture, temperature, and oxygen partial pressure also affect the activity of plant roots and thus plant susceptibility. Generally, shortage of soil moisture decreases susceptibility and abundance of fertilizer increases susceptibility. Certain stages of growth are more susceptible to pollution than other stages. Time of day and season can also affect the amount of damage.

30479 **APTIC NO. 52409**

Matsuchima, Jiro

MONITORING OF AIR POLLUTION USING PLANTS AS MONITORS. *(Shokubutsu o shihyo to shita taiki osen no kanshi). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):259-260, 1973.*

Plants can be used to monitor air pollution by measuring the characteristic visible damage and its degree, the defoliation and discoloration, the retention of pollutants by the leaf, and the effects on reproduction. Indicator plants should be very susceptible to one specific pollutant or equally susceptible to every pollutant by showing specified symptoms. Such plants should also constantly develop new leaves and be resistant to diseases and insects. Alfalfa and buckwheat are used to monitor sulfur dioxide. Pinus densilflora is susceptble to SO2. Gladioli and turnips are susceptible to hydrogen fluoride. Apricot, plum, and grape are weak indicators of HF. Tobacco and morning glory can be used to measure ozone. Petunia shows specific damage due to peroxyacetyl nitrate. Buckwheat and tomatoes react to ethylene and propylene as if they were exposed to growth homones at levels of 0.05 and 0.1 ppm, respectively. Measuring pollutant concentrations in leaves is used to measure chronic effects of low concentrations of pollutants, such as HF in citrus leaves. Sulfur is naturally contained in normal plants and the content varies with the season, however, S content in citrus leaves is unusually high when the plants are grown in a SO2-rich atmosphere.

30480 **APTIC NO. 52306**

Moura, J. de, D. le Tourneau, and A. C. Wiese

THE RESPONSE OF POTATO (SOLANUM TUBEROSUM) TUBER PHOSPHOGLUCOMUTASE TO FLUORIDE. *Biochem. Physiol. Pflanzen, 164(3):228-233, 1973. 12 refs.*

Most research on the effects of fluoride ions in plants has been concerned with aerial parts. For observation of the response to underground tissues, potato tubers were fluoridated. At the same time in vitro studies on the effect of fluoride on phosphoglucomutase (PGM) from untreated tubers were made. Protein content was measured by Eaddell s method. Najjar s procedure was modified for enzyme activity tests. Phosphoglucomutase was partially purified from potato tubers and was relatively insensitive to the presence of fluoride ions in vitro. The enzyme was activated by magnesium(++) but not by manganese(++) ions, and was not inhibited by fluoride(-) in the presence of Mn(++). The enzyme was relatively insensitive to F(-) when Mg(++) was present, but the amount of inhibition was dependent on the level of Mg(++) and, more importantly, on the order of mixing the reagents prior to the assays. (Author abstract modified)

30481 **APTIC NO. 52109**

Sawada, Tadashi and Toshio Odaira

THE PRESENT STATE OF PLANT DAMAGE IN TOKYO BY AIR POLLUTION. *(Tokyo-to ni okeru taikiosen ni yoru shokubutsu higai no genjo). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 27(6):241-244, June 1973. 10 refs.*

Secondary pollutants such as oxidants are causing increased plant damage in urban areas. Photochemical smog occurred for the first time in Tokyo on July 18, 1970 when high school girls suffered respiratory symptoms and plant damage occurred, including defoliation of the zelkova trees in rural areas of Tokyo. Smog damage is especially noticeable on zelkova trees, poplar, platanus, ginkgo, and Japanese hibiscus -- it causes untimely defoliation or discoloration, dehydration, and curling of leaves. Damage is also severe and quick in green vegetables such as spinach, Japanese radish, salting greens, and leeks. The investigation results did not necessarily coincide with experimental results for ozone. Oxidants were judged to be the major cause of plant damage in the Tokyo area. Sulfur dioxide pollution, effects on plants, and its use as an indicator of pollution is mentioned.

30482 **APTIC NO. 52461**

Shinozaki, Mitsuo

THE STATUS QUO OF PLANT DAMAGE BY AIR POLLUTION IN KANAGAWA PREFECTURE. *(Kanagawa-ken ni okeru taiki osen ni yoru shokubutsu higai no genjo). Text in Japanese. Shokubutsu Boeki(Plant Prot.), 27(6):245-248, 1973.*

Sulfur oxides and photochemical oxidants cause plant damage in Kanagawa Prefecture. Ginkgo trees are conspicuously affected by SOx; leaf surface area increases with increasing distance away from the industrial area; sulfur, iron, zinc, lead, copper, nickel, and cadmium content of the leaf increases with decreasing distance between the ginkgo trees and the industrial area. Physiological effects occur when the content of S, Fe, and Pb become more than 4000, 1000, and 10 ppm, respectively. Sulfur content and effects differ with different plant species. The sulfur content of an upolluted area's trees can be set at 100 as an index, and the sum of the indices of ginkgo, zelkova, and pine trees then represents the air pollution of that area. Photochemical oxidants occurred 11 times in 1971 and 31 times in 1972 throughout the Prefecture. Japanese leek, spinach, turnip, salting green, and soy plants show oxidant damage. Chard damage can act as a pollution index. Chard indicator plants were planted at 60 places; damage was assessed on the 20th of each month and after oxidant concentrations exceeded 0.15 ppm. Of 3755 samples, 157 samples had damage, including 69 of chard, 20 of spinach, 12 of turnip, and 11 of Japanese radish. Of 49 species, damage was observed on 14 species. Damage was greater in the inland area. Chard damage includes chlorosis and necrosis on both sides of the leaf, a different result than that obtained during a laboratory test with 0.15 ppm of ozone for 6-10 min. Spinach damage in the Prefecture resembled damage produced during a laboratory exposure to 0.4 ppm of ozone.

30483 **APTIC NO. 52443**

Smith, William H.

METAL CONTAMINATION OF URBAN WOODY PLANTS. *Environ. Sci. Technol., 7(7):631-636, July 1973. 46 refs.*

During the fall of 1970, leaf and twig tissue representing the growth of the previous growing season was collected from six woody plant species throughout the city of New Haven and was analyzed for contents of aluminum, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, sodium, strontium, zinc, and vanadium by atomic absorption spectrophotometry. Sugar maple from New Hampshire and Vermont was also sampled and analyzed. The presence of Co and Sn was not detected, and V was present in only a few samples from two city species. All other metals were determined in all the woody plants and the sugar maple samples, with Cd, Cu, and Mn present in normal amounts; Al, Cr, and Ni in slightly above-normal amounts, and Fe, Pb, Na, and Zn in above-normal amounts. The mean Pb concentrations exceeded most Pb concentrations determined for trees in areas with geologic Pb deposits or adjacent to primary highways. (Author abstract modified)

30484 **APTIC NO. 52096**

Tsunoda, Fumio and Hiroko Kunita

FLUORINE CONTENT OF PLANTS AND ANIMALS. *(Doshokubutsu-chu no fusso ni tsuite - shizen to osen). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(6):613-619, June 1973. 19 refs.*

The fluoride content in the air can be measured by plant indicators, either by the extent of plant damage or by the cumulative fluoride content in the plant. The latter seems to be more effective when dealing with fluorine in the air, since a considerable amount of F accumulation in the plant sometimes does not manifest itself in damage. Leaves of gladioli are often used as indicators, but experiments have shown that the leaves of wild iris and flags are just as susceptible to F in the air. The pine and cedar needles and tulip and orange leaves are also sensitive indicators. The measurements of soluble fluorine in the air were taken for the past 5 years by the lime treated filter paper method and a dust meter in seven polluted areas, and the cumulative F content in the leaves of iris in these areas were compared with iris leaves in control areas. By the characteristic translocation of F, the tips and edges of leaves had much higher F content than other parts of the same plant. Approximately 1/3 of the measurements in those parts could be considered as a pollution index. The leaves taken from the most polluted areas showed approximately 80 times over the leaves from control areas in dry weight. Even 1/3 of the actual measurements was 100 ppm in dry weight, 30 ppm in raw weight. The produce in air polluted area has 5-10 ppm F content in polished rice and green vegetables. If the daily consumption of rice is 308 g/capita, 3.08 mg of F is taken daily into the human body.

30485 **APTIC NO. 51976**

Zimdahl, Robert L. and Jon H. Arvik

LEADS IN SOILS AND PLANTS: A LITERATURE REVIEW. *CRC Critical Rev. Environ. Control, 3(2):213-224, Feb. 1973. 129 refs.*

The distribution of lead in the environment is altered by the activities of man, principally through its use as a fuel additive. Lead appears in automobile exhaust as halides, hydroxides, and oxides, with lesser amounts of carbonates and sulfates. Lead concentrations decrease rapidly with depth in the soil and distance downwind from a source, and show a positive correlation with traffic volume. Lead in soil is moved slowly by leaching, due to sorption and formation of insoluble compounds. Sorption of lead by soils is positively correlated with cation exchange capacity. Lead can be taken up by plant roots if in an available form, but the soil sorption phenomena and precipitation prevent uptake of large amounts unless soil lead levels are extremely high. Lead can be absorbed by plant foliage but much of it is apparently in the form of a surface deposit. Lead content of plants grown in natural soils is generally less than 10 ppm dry weight. When taken up by a plant, lead may be found principally in the roots, with little translocation to the shoot. Lead uptake is enhanced by low soil pH and can be reduced by liming the soil. (Author summary modified)

1972

30486 **APTIC NO. 51754**

Kanagawa Prefecture Agricultural Experiment Station (Japan)

COOPERATIVE STUDIES ON THE EFFECTS OF AIR POLLUTANTS ON GARDEN PLANTS (I). *(Taiki osen busshitsu ga engei sakumotsu nado ni kansuru kenkyu seisekisho (I)). Text in Japanese. 136p., Feb. 1972.*

Cooperative studies were conducted on the general effect of air pollution throughout Kanagawa Prefecture. Studies included periodical measurement of pollutants, plant damage examinations, evaluations of plant indicators, and measurement of sulfur, heavy metals, and fluorine. Gingko and pine were chosen as general plant indicators, and as area representatives, mulberry leaves from the north, pear and grape leaves from the center, and orange leaves from the western part of of the Prefecture were selected. Gingko and pine samplings in Kawasaki were extremely unhealthy in appearance, compared to those from suburban Kawasaki, and the northern, central, western, and coastal areas. The S content in leaves was extremely high in Kawasaki, and a particularly high ratio of nonsoluble S was noted. In all categories of metals, samples from Kawasaki had the highest content, but other than that, generally leaves from the western part of the Prefecture had high counts of iron, zinc, copper, nickel, lead, and manganese. The average fluorine content in leaves was 135 ppm, 22 ppm minimum, and 1653 ppm maximum. The differences by locations and tree specimens were extremely high. If the F index of leaves in the industrial area is considered to be 100, those in commercial, residential, and agricultural areas were less than 20-30. There was a correlation of 0.711 between F and S content of gingko trees. There was an extremely close correlation between the F content of leaves and the amount of settling particles and sulfur oxides concentration in the air. The F content in the leaves increased with the season; at the peak, it reached three to eleven times the amount in new leaves in May.

30487 **APTIC NO. 51953**

Inst. for Policy Sciences (Japan)

PROGRESS TOWARD AN ECOLOGY SYSTEM DESIGNED TO HARMONIZE INDUSTRIAL ACTIVITIES AND NATURE. *(Sangyo katsudo to shizen to no chowa no tame no ekoroji shisutemu e no sekkin). Text in Japanese. 509p., March 1972. 47 refs.*

Sulfur dioxide emitted mostly from factories is believed to be responsible for most of the plant injuries. Although there are differences of the resistances toward this particular gas, most of the plants die in a few hours after being exposed to 0.4 to several ppm of sulfur dioxide. The injured plants generally show gray or brown spots on veins of leavs which eventually fall. The SO2, when washed by rain into soil, reacts with calcium and consumes the nutrients. Carbon monoxide and hydrocarbons of low molecular weight cause the destruction of chlorophyll and the abnormal falling of leaves. Other air pollutants that inhibit the growth and damage the plants include nitrogen oxides, smog, hydrogen fluoride, chlorine, hydrogen chloride, and airborne particulates.

30488 **APTIC NO. 52227**

Bravo A., Humberto

THE USE OF COLOR INFRARED PHOTOGRAPHY IN THE DETECTION OF NON-VISIBLE INJURY TO VEGETATION BY OZONE. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 268-273. 13 refs. (May 15-18.)*

Ektachrome Infrared film and regular color film were used to detect nonvisible injury from ozone to Bel-W tobacco, soybeans, and oats. Close-up photographs using adequate filters were taken under normal sunlight conditions and with an artificial light source during specific periods of time following fumigation with low levels of ozone for up to 3 hr. Visual inspection and ordinary color photographs of tobacco and soybean 3 hr after exposure to 60 pphm ozone for 2 hr showed no injury. Infrared films, however, indicated loss of reflectance due to injured cells. Injury to oats exposed to 10 or 30 pphm ozone was clearly visible on infrared color film 48 hr before visual injury was present. Infrared photographs 6 hr following fumigation of oats with 30 pphm ozone for 1 1/2 hr showed a distinctive color difference at the tip of the blade and the apex of the bend as compared with control oats. Necrosis was apparent after 20 hr. Six hours following fumigation with 10 pphm ozone for 1 1/2 hrs, oats showed a change in color at the apex of the bend progressing toward the tip. With soybeans, infrared color film showed no distinctive color differences prior to detectable visible injury. This was attributed to the presence in the soybean of a palisade layer of cells which prevented immediate ozone attack on highly reflective mesophyll cells. Infrared color photography can be an indicator of nonvisible injury in oats and other crops which may result in reduced yields and growth.

30489 **APTIC NO. 52387**

Broyer, T. C., C. M. Johnson, and R. E. Paull

SOME ASPECTS OF LEAD IN PLANT NUTRITION. *Plant Soil, 36(2):301- 313, 1972. 10 refs.*

Accretion of lead by abscised barley roots from a lead nitrate solution was metabolically obtained, complemented by a fraction acquired physico-chemically. Added calcium supply did not significantly modify lead accretion. A ten-fold increase in supply concentration produced approximately a two-fold increase in lead accretion. During growth of bean, barley, and tomato plants in solution cultures, a substantial part of the lead supplied became associated with the roots; correspondingly little was present in the tops. A very large fraction of the lead associated with the roots of barley was readily extracted by various solvents, probably resident on the root surface or from free spaces therein; the remainder of the lead acquired may have been that sorbed within the root cells. A possible relationship of lead to phosphate accretion was not evident. There was no apparent effect of applied lead on the sorption of the other elements supplied. Plant dry weights, their top to root ratios and dry-weight percentages were constant under various lead supply concentrations in solution. Where lead supplies were advertently withheld, lead contents in plants were 5 to 25 times that which could have been expected under the sollution culture conditions in a greenhouse with carbon filtered ambient air supply. Restriction of advertent lead supply caused no limitation of growth. If lead is essential to growth of these plant species, the critical concentration will probably be less than 2 to 6 ng atoms/g dry weight in plant tops. (Author summary)

30490 **APTIC NO. 52102**

Maeno, Michio

AIR POLLUTION AND PLANT COMMUNITY *(Taiki osen to shokubutsu gunraku). Text in Japanese. In: Data on Pollution, No. 34: Environmental Protection Bureau, Yokohama City--Special Series City Environment and Biological Index. Yokohama Municipal Office (Japan), Environmental Protection Bureau, p. 21-28, April 1972.*

The threshold of plant damages by pollutants such as ozone, peroxyacetyl nitrate, nitrogen dioxide, sulfur dioxide, hydrogen fluoride, chlorine, and ethylene, the general damage symptoms, the location of damages on plants, and vulnerable parts in plant structure are discussed and presented in a table. The external appearance of plant damage can be used as an index for air pollution. With some fluctuation by tree types, trees such as zelkova, gingko, and plane follow certain curves formed by damage indexes and the distances from the industrial areas. Also, the relationship between sulfur oxide concentration in the air and the sulfur trioxide content in the leaves of gingko forms a linear graphic relationship. The effect of SO2 on the general deterioration of trees and the sulfur content of tree leaves seem to have a certain relationship. Most of SO2 gas absorbed through the leaves into plants is accumulated as inorganic sulfuric acid ion, and very small amount changes into organic sulfur. The degree of sulfur degradation in plants are clearly different by the geographical locations of the plants, and in heavily polluted areas, the sulfur content in gingko leaves increase as time passes and reaches as high as 1.4% before the leaves drop. The portion that increases is soluble sulfur, and insoluble organic sulfur seems to remain at the same level. There is not much geographical difference in the amount of organic sulfur. Therefore, as an air pollution indicator, soluble sulfur, or the ratio of soluble sulfur to the total sulfur content in the tree should be considered.

30491 **APTIC NO. 52222**

Price, Harvey and Michael Treshow

EFFECTS OF OZONE ON THE GROWTH AND REPRODUCTION OF GRASSES. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 275-280. 7 refs. (May 15-18.)*

Fumigation studies were undertaken to determine the effects of photochemical pollutants on the productivity and reproductive potential of Gambel Oak and Quaking Aspen, the most important watershed communities of the Wasatch Mountains of Utah. Sensitivity thresholds, based on visible injury, for a species were determined by fumigating transplanted plants with 5-35 pphm ozone for 4 hr. Once the sensitivity threshold was established, the species was fumigated consecutively for 5 days to determine the acute threshold. This was the level at which daily tissue injury occurred and was generally 3-4 pphm higher than the sensitivity threshold. To determine the effects of long-term ozone fumigation, a regime of 15-18 pphm for 1 hr, 28-33 pphm for 2 hr, and 18-20 pphm for 1 hr was followed during the life cycle fumigation of selected plants. Leaf length and number, total dry weight of plant, and weight and number of inflorescences and florets were measured as parameters of productivity and reproduction. The results indicate a potential decline in the plant populations studied can occur under conditions producing chronic injury to leaf tissue. Automotive exhaust emissions must be controlled and ozone concentrations prevented from exceeding 20 pphm.

30492 **APTIC NO. 52378**

Smith, David W., Carl B. Fliermans, and Thomas D. Brock

TECHNIQUE FOR MEASURING 14CO2 UPTAKE BY SOIL MICROORGANISMS IN SITU. *Appl. Microbiol., 23(3):595-600, March 1972. 12 refs.*

Uptake of (14)carbon dioxide in soils due to algae or sulfur-oxidizing bacteria was examined by incubation of soil samples with gaseous (14)CO2 and subsequent chemical oxidation of biologically fixed radioactive isotope to (14)CO2 for detection with a liquid scintillation counting system. The (14)CO2 was added to the soil in the gas phase so that no alteration of the moisture or ionic strength of the soil occurred. Wet oxidation or radioactive organic matter was carried out in sealed ampoules, and the (14)CO2 produced was transferred to a phenethylamine-liquid scintillation counting system with a simply constructed apparatus. The technique is inexpensive and efficient and does not require elaborate traps since nonradioactive CO2, chloride, and water have no harmful effects. Experiments is coal mine regions and in geothermal habitats demonstrated the applicability of the method for in situ ecological studies in soils. (Author abstract modified)

30493 **APTIC NO. 52290**

Smith, William H.

AIR POLLUTION--EFFECTS ON THE QUALITY AND RESILIENCE OF THE FOREST ECOSYSTEM. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 20p., 1972. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

Air pollution has and will continue to influence forest ecosystems throughout the temperate regions of the world. Under conditions of low dosage, Class I relationship, the vegetation and soils of forest ecosystems presumably function as an important sink for air contaminants. When exposed to intermediate dosage, Class II relationship, individual tree species or individual members of a given species may be adversely affected by nutrient stress, have reduced photosynthetic or reproductive rate, or have direct disease induction. Exposure to high dosage, Class III relationship, may induce acute morbidity or mortality of specific trees. Future research should concentrate on Class I and II relationships, since these are considerably more significant than Class III relationships. Six factors must be taken into account: the highly variable response of individual trees within a single species and of various species to individual air pollutants; the strong controlling influence of local edaphic, topographic, and meteorological conditions on plant response; the fact that deciduous trees and most forest shrub and herb species have not been properly evaluated; most available data stems from studies with sulfur dioxide and ozone applied to plants singly; (5) most research has employed air pollution dosages in excess of ambient forest levels; and most investigations have been carried out under highly controlled, and hence artificial, environments.

30494 **APTIC NO. 52267**

Turunen, Johannes and Asko Visapaa

SULPHUR IN PINE NEEDLES AND BIRCH LEAVES. PART I. DETERMINATION OF THE SULPHUR CONTENT BY X-RAY FLUORESCENCE. *Pap. Puu, no. 2:59-67, 1972. 14 refs.*

A method is described for determination of the sulfur content of pine needless and birch leaves by means of X-ray fluorescence. A pellet weighing 1.4 g is prepared from dried and milled material, and the net intensity of the SK(alpha)I-line obtained from it is determined by application of the ratio method and an external standard. A flow counter and a pentaerythritol analyzing crystal were employed. The calibration lines were obtained by means of samples to which had been added known amounts of sulfanilic acid. The sulfur content of the basic materials was obtained from the calibration lines, and checked by chemical means. The error of the method is + or 0.002% S at the level of 0.12% S for pine needles, and + or 0.003% S at the level of 0.23% S for birch leaves. One determination takes about 3 min, including preparation of the pellet. Details of the method are presented, and a statistical examination is made of the results obtained (Author abstract)

1971

30495 **APTIC NO. 52255**

Druilhet, A., A. Perrier, J. Fontan, and J. L. Laurent

ANALYSIS OF TURBULENT TRANSFERS IN VEGETATION: USE OF THORON FOR MEASURING THE DIFFUSIVITIY PROFILES. *Boundary-Layer Meteorol., 2(2):173-187, Dec. 1971. 25 refs.*

The analysis of turbulent transfer is the basis for an interpretation of the growth and development rates of vegetation as a function of certain essential parameters, such as the temperature of the vegetal organs, the rate of absorption of carbon dioxide, and the water consumption. These parameters are functions of energy and mass exchanges at different heights. Their intensities depend upon the value of the transfer coefficients in the vegetation. The aerodynamic and the thoron methods are used in this investigation. The thoron diffusivity profiles show an important distortion in the middle zone of the canopy, below the maximum of leaf density. This distortion is associated with a maximum source of sensible heat flux at these levels, which partially invalidates the aerodynamic approach.

30496 **APTIC NO. 52397**

Peterson, P. J.

UNUSUAL ACCUMULATIONS OF ELEMENTS BY PLANTS AND ANIMALS. *Sci. Prog., Oxf., 59(236):505-526, Winter 1971. 79 refs.*

The accumulation of certain elements to very high levels by plants and other organisms is outlined. In higher plants, the ability to accumulate elements and to survive on soils containing toxic quantities of various elements occurs sporadically throughout different species, but in lower plants a higher concentration of some elements is typical of a particular order. Elements accumulated by some higher plants include copper, strontium, calcium, zinc, rare earths (the hickory tree), aluminum, silicon, and nickel. Among lower plants, algae accumulate iodine and bromine dust; fungi, selenium and vanadium; mosses, copper, boron, and vanadium; lichens, ytrrium, gallium, tin, and lead; horsetails, silicon and zinc; lycopods, aluminum; and ferns, yttrium and uranium. Copper, cadmium, arsenic, barium, and fluoride are accumulated by certain marine organisms. Mammalian accumulator tissues exist for many elements including iodine, titanium, aluminum, vanadium, zirconium, and selenium. Some of the mechanisms which may enable an organism to survive an accumulated element are: the toxic element is excluded or partially excluded from the cells; the element is confined to the cell wall; the element enters the cell and is metabolized to possibly inactive components or by binding with another compound.

30497 **APTIC NO. 52385**

Taniyama, Tetsuro, Hiroki Arikado, and Yukihiro Iwata

STUDIES ON THE MECHANISM OF INJURIOUS EFFECTS OF TOXIC GASES ON CROP PLANTS. IX. EFFECT OF SULFUR DIOXIDE TREATMENT FOR LONG PERIOD ON DRY MATTER PRODUCTION IN RICE PLANTS. *(Sakubutsu no gasu shogai ni kansuru kenkyu. Daikyuho Aryusan gasu (SO2) no chokikan sesshoku ga suito no kanbutsu seisan ni oyobosu eikyo). Text in Japanese. Nippon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), 40(4):455-461, 1971. 13 refs.*

An experiment was undertaken to prove the decrease of dry matter production in rice plants caused by sulfur dioxide treatment for long period of time. The number of tillers in rice plants decreased with an increase in the concentration of SO2, but the plant height and leaf age in rice plants did not show any significant differences. Total dry weight of leaves, stems, and roots of rice plants gradually decreased with an increase in the concentration of SO2 and an extension of treatment hours for which the plants were exposed to the gas. A typical injury by SO2 was not discovered on the leaf-blade and sheath during and after treatment. Net assimilation rate and increase rate of dry matter in the rice plants were markedly decreased by SO2 treatment for long time.

30498 **APTIC NO. 52365**

Ter Haar, Gary L.

THE EFFECT OF LEAD ANTIKNOCKS ON THE LEAD CONTENT OF CROPS. *J. Wash. Acad. Sci., 61(2):114-120, June 1971. 25 refs.*

Man receives on the average about 300 micrograms lead/day in his food. This natural concentration of lead in food results from the lead present in the soil. The lead in soils averages about 16 micrograms/g worldwide. Under conditions that have thus far been studied, lead in air does not measurably increase the lead content of the edible portion of most crops. Leafy portions of plants near busy highways contain higher concentrations of lead. Even in the absence of lead in air, leafy portions of plants contain more lead than do other parts. A several-fold increase in lead in soil does not measurably change the concentration of lead in plants. Rainwater does not appear to be a significant source of lead in crops. All studies to data indicate that the effect of lead antiknocks on lead in the food chain is minimal. (Author abstract)

1969

30499 **APTIC NO. 51908**

Bennett, Jesse Harland

EFFECTS OF OZONE ON LEAF METABOLISM. *Utah Univ., Salt Lake City, Dept. of Biological Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1969, 106p. 162 refs.*

The effects of ozone on leaf intermediate metabolism were investigated. Deviation from a specified steady state condition and deviation from a forced change in the metabolic direction were used to assess ozone induced effects on the leaves of pinto beans. Pinto bean leaves were most sensitive to ozone injury 11-15 days after planting. The sugar levels were relatively low, amides and amino acid levels were high, and organic acid levels were increasing at the time of maximal sensitivity. In all the experiments, ozone damaged leaves increased their metabolite levels. Acute effects of ozone were manifested by an accumulation of water in leaf intercellular spaces and various degrees of foliar wilting. Moderate effects were characterized by some degree of tissue destruction.

1967

30500 **APTIC NO. 51905**

Gerdes, Raymond Allen

EFFECT OF ATMOSPHERIC HYDROGEN FLUORIDE UPON DROSOPHILA MELANOGASTER. *Texas Agricultural and Mechanical Univ., College Station, Dept. of Genetics, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1967, 57p. 33 refs.*

The effects of gaseous hydrogen fluoride on Drosophila melanogaster (flies) were investigated. The populations were exposed to different concentrations of HF for various treatment periods, and the effects on fecundity, hatchability, fertility, longevity, and generation time were studied. All of the parameters except generation time responded significantly to the HF treatment, with a range of responses from lethality to relatively no effect. The lethal concentration varied with strains but was very low for all the strains. In sublethal concentrations, the major treatment response was a function of treatment duration. Sublethal concentrations (less than 7.5% HF) caused measurable deleterious effects in the traits exhibited in the two strains, Oregon-r and yw, at the treatment levels and durations studied. (Author summary modified)

30501 **APTIC NO. 51907**

Newton, David Comstock

BEHAVIORAL RESPONSE OF HONEY BEES (APIS MELLIFERA L. (HYMENOPTERA: APIDAE)) TO COLONY DISTURBANCE BY SMOKE, ACETIC ACID, ISOPENTYL ACETATE, LIGHT, TEMPERATURE AND VIBRATION. *Illinois Univ., Urbana, Dept. of Entomology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1967, 68p. 44 refs.*

The responses on honey bees to various disturbances were investigated. The reaction of the bees to opening and examining their colonies included aggression, cleaning movements, disturbance of departing foragers, engorging, guarding, nondirected locomotion, scent fanning, trooping behavior, and ventilatory fanning. Alteration of light level produced little measurable response. Currents of cold and hot air caused adjustments in thermoregulatory behavior. Smoke, acetic acid vapor, and vibration caused engorging behavior. Bees 1-31 days old reacted to smoke by engorging, i.e., ingesting ripening or sealed honey, preceded by uncapping of honey storage cells. The maximum number of bees engorged approximately 2 min after a disturbance and included up to 60% of the bees on a comb. Individual bees required a mean time of 134 sec to engorge. Smoke reduced the number of guards and departing foragers for approximately 10 min. Smoke or acetic acid vapor also released cleaning movements among up to 40% of the bees. (Author summary modified)

1962

30502 **APTIC NO. 51910**

Smith, Richard Furnald

BIOLOGICAL EFFECTS OF IONIZED AIR. *Arizona Univ., Tucson, Dept. of Agricultural Biochemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1962, 66p. 63 refs.*

The action of positively and negatively air ions on plants was investigated. Positively ionized air stimulated the growth and movement of blue-green and green algae. The gaseous component responsible for the action was positively ionized carbon dioxide. The mechanism of the effect of positively-ionized air was studied. The theory that positive air ions acted on plant tissues by causing the release of bound indole-e-acetic acid was confirmed by laboratory experiments. The effect of ions on ciliated epithelial cells in rabbit trachea was studied. (Author summary modified)

EFFECTS-MATERIALS

1973

30503 **APTIC NO. 52279**

Beloin, Norman J.

FADING OF DYED FABRICS EXPOSED TO AIR POLLUTANTS. *Text. Chem. Color., 5(7):128-133, July 1973. 15 refs.*

The fading of dyed fabrics exposed to air pollutants was investigated. Twenty dye-fabric combinations were exposed to two levels each of nitrogen dioxide, ozone, sulfur dioxide, and nitric oxide at four combinations of temperature and humidity for a period of 12 weeks. Appreciable fading resulted from nitrogen dioxide, ozone, and sulfur dioxide exposure. In addition, the study confirmed that temperature and relative humidity have a significant effect on dye fading. (Author abstract)

30504 **APTIC NO. 52494**

Dreulle, N. and P. Dreulle

RELATIONSHIPS BETWEEN ENVIRONMENTAL POLLUTION AND THE CORROSION OF ZINC AND OF ELECTROPLATED STEEL. *(Les relations entre la pollution de l environnement et la corrosion du zinc et de l acier galvanise). Text in French. Corrosion, 21(2):114-119, March 1973. 10 refs.*

In a humid non-polluted atmosphere a basic zinc carbonate forms on metallic zinc which as a screen protects the zinc surface from oxygen. Sulfur dioxide in whatever form converts surface zinc oxide to an insoluble sulfite which in turn is oxidized to soluble sulfate and removed by rain water; this process eats the zinc away. Corrosion velocity was measured in eight different locations from an industrial to an urban one. The finding was that the higher the SO2 content in the atmosphere, the higher the corrosion. In certain special cases, microlocation was found to play a primary role. Thus Marseille possessed an atmosphere safe to zinc in comparison with other cities due to its dry climate. Corrosion velocity of zinc expressed in g/sq dm varies according to season. From March to September it is of the order of 0.07, while from September to March it is 0.15, the result of increased humidity. Corrosion becomes noticeable beginning with a relative humidity of 70%; at high levels of humidity, corrosion velocity increases linearly with the SO2 content in the corroding atmosphere. The life expectancy of zinc-covered roofs in industrial areas is around 30 years, while in rural areas it can exceed 100 years.

30505 **APTIC NO. 51794**

Fischer, H.

FIFTEEN YEARS OF GERMAN CORROSION RESEARCH WITHIN THE RESEARCH PROGRAM CORROSION OF THE GERMAN FEDERAL REPUBLIC - PART I. *(15 Jahre deutsche Korrosionsforschung im Forschungsprogramm Korrosion der Deutschen Bundesrepublik - Teil I). Text in German. Werkstoffe Korrosion, 24(6):525-535, 1973.*

The research program concerning corrosion by the Federal Republic of Germany cost the federal government 4 million dollars. It ran from 1957 to 1972. The high sum of money spent is justified in view of the fact of the enormous losses each year by corrosion. An English expert commission has figured out a loss of about $3.3 billion dollars for the United Kingdom for 1968. In the Federal Republic, the losses were reported to be even higher for the same year. Within the research program all aspects of corrosion as well as the corrosion mechanisms were studied including atmospheric corrosion and high-temperature corrosion. Atmospheric rusting was simulated. In the wake of these tests it was found that aluminum is less affected by sulfur dioxide than other metals. The research program also included a study of the influence of flow, pressure and radiation (photocorrosion), the corrosion influence of solvents, and mechanical distortion. The results of all studies are briefly outlined.

30506 **APTIC NO. 52320**

Luckat, Siegbert

THE ROLE OF AIR POLLUTANTS IN STONE DECAY. *(Die Wirkung von Luftverunreinigungen beim Steinzerfall). Text in German. Staub, Reinhaltung Luft, 33(7):283-285, July 1973. 13 refs.*

Investigations into weathering phenomena on structures built of natural stone, and comparative considerations in the case of increased emissions (in particular, the measurements of absorption rates of noxious substances) clearly show that air pollutants are one of the causes of stone disintegration. Sulfur dioxide and sulfuric acid which forms from it, must be given here as the main components of pollutants. Four different types of prism-shaped sandstone and one trachyte with a base area of 100 by 200 mm and a height of 300 mm were exposed at four different points in North Rhine Westphalia. One was set up on the premises of the Landesanstalt fuer Immissions- und Bodennutzungsschutz in Essen, one at a heavily polluted point in Duisburg, one in Herten, and one near Burgsteinfurt in the Northern Muensterland. Apart from climatological data, the intake rates for SO2, chloride, and fluoride were determined with the aid of physical-chemical sorption process. The unprotected sample in Duisburg showed the first signs of decay after 6 mo. On the sample in Burgsteinfurt, lichens began to grow. A table lists the emission intake of chloride, fluoride, and SO2 by the four different samples and by the Cathedral in Cologne. At the point in Essen the average SO2 emission intake rate for the period May 10, 1972 to Feb. 27, 1973 was 98.58 mg/sq m/day, for chloride 13.63 mg/sq m/day, and for fluoride 0.815 mg/sq m/day. In Duisburg the average values were 129.84 mg/sq m/day for SO2, 15.77 mg/sq m/day for chloride and 0.789 mg/sq m/day for fluoride. At the Dome in Cologne the average emission intake rate for the period Aug. 8, 1972 to Feb. 27, 1973 for SO2 was 144.27 mg/sq m/day, for chloride 18.00 mg/sq m/day, and for fluoride 1.367 mg/sq m/day.

30507 **APTIC NO. 51818**

McKinney, Mary and Esther R. Broome

ATMOSPHERIC CONTAMINANTS: EFFECT ON VAT-DYED COTTONS. *Am. Dyestuff Reptr., 62(3):81-82, 87, March 1973.*

The effects of different levels of atmospheric contaminants on the colorfastness, strength, and soiling of cotton fabrics was determined. Muslin and twill fabrics of 100% cotton, dyed to various hues with vat dyes, composed the test specimens for the study. The experimental fabrics were tested following a 60-day exposure period at three designed sites within the city of Fort Worth, Texas. The change in percent reflectance of the vat-dyed fabrics proved to be somewhat related to the hue of dye, the fabric construction, and in some instances, to the level of contamination to which the fabrics were subjected. The yellow and orange fabrics, irrespective of weave and exposure site, displayed the greatest percent color change from the original, while the red and green fabrics experienced an intermediate change, and the blue specimens the least percent change. In some instances the twill fabrics excelled in color retention. Generally, the twill fabrics retained more of their color than did the muslin yellow, orange, and red dyes.

30508 **APTIC NO. 52192**

Mikhaylovskiy, Yu. N., G. B. Klark, L. A. Shuvakhina, V. V. Agafonov, and N. I. Zhuravleva

COMPUTING THE RATE OF CORROSION OF ALUMINUM AND ITS ALLOYS IN DIFFERENT CLIMATIC ZONES ON THE BASIS OF METEOROLOGICAL PARAMETERS. *(Raschet skorosti atmosfernoy korrozii alyuminiya i yego splavov v razlichnykh klimaticheskikh zonakh po meteorologicheskim parametram). Text in Russian. Zashch. Metal., 9(3):264-269; 1973. 6 refs.*

Relationships between temperature, humidity, sulfur dioxide, and chlorine concentrations and the rate of corrosion of aluminum and aluminum alloys were determined in field tests for the development of a method for the calculation of the rate of corrosion of aluminum and aluminum alloys in any climatic zone from such meteorological and pollution characteristics. Correlation coefficients of 0.6 to 0.9 were determined for the relationship of the rate of corrosion with the duration of periods with humidities over 80%. The rate of corrosion was highest in a temperature range from 5 to -5 C. The mean rate of aluminum corrosion in a clean atmosphere is practically independent of the nature of the moisture coating, which is characteristic of metals that preserve their inactivity under atmospheric conditions.

30509 **APTIC NO. 52194**

Rybakov, B. N., A. F. Moskvicheva, and G. D. Beregovaya

CORROSION OF LANTHANUM UNDER ATMOSPHERIC CONDITIONS. *(Korroziya lantana v atmosfernykh usloviyakh). Text in Russian. Zashch. Metal., 9(3):303-306, 1973. 9 refs.*

The effect of temperature, humidity, carbon dioxide, hydrogen sulfide, and sulfur dioxide on the rate of atmospheric corrosion of lanthanum was studied in field tests. Independently of the humidity content, the rate of the atmospheric oxidation of lanthanum became linear function of time after exposure for 40 to 60 hr. Oxidation and formation of lanthanum hydroxide due to intense adsorption of water, with subsequent peeling off of the rather loose hydroxide layer was observed. Strong dependence of the rate of corrosion of the water vapor partial pressure, especially in a humidity range of 15-32%, was observed. Increase in the rate of corrosion with rising temperature, and an activation energy of 21.3 + or 0.5 kcal/mol were determined. Carbon dioxide, H2S, and especially SO2 caused increase in the rate of corrosion of lanthanum. Sulfates and sulfites due to the SO2-induced corrosion, and carbonates due to CO2-induced corrosion were tentatively determined.

30510 **APTIC NO. 52190**

Svoboda, M., G. Klichova, and B. Knapek

POSSIBILITY TO REDUCE THE RATE OF SULFUR DIOXIDE PENETRATION IN PAINT COATINGS. *(O vozmozhnosti ponizheniya skorosti proniknoveniya dvuokisi sery v lakokrasochnuyu plenku). Text in Russian. Zashch. Metal., 9(3):301-303, 1973. 4 refs.*

The possibility of the reduction of the rate of sulfur dioxide penetration through alkyd protective coatings into the metal through the catalytic oxidation within the mass of the coating of SO2 into sulfate, and through binding the latter in the form of insoluble salts was studied in laboratory tests. The catalysts introduced into the alkyd coating were manganese dioxide, lead dioxide, lead monoxide, copper oxide, ferric oxide, tin oxide, and zinc oxide. The resulting sulfate was converted into insoluble salt by means of barium carbonate or lead tetroxide. Manganese dioxide, lead dioxide, copper carbonate, copper hydroxide, ferric oxide, and ferric hydroxide was catalysts were more effective in combination with barium carbonate than they were in combination with lead tetroxide. The inorganic compounds in the protective coating reduced the rate of SO2 penetration by 150-500%.

30511 **APTIC NO. 52517**

Talbot, Jean

SCIENTIFIC ASPECTS OF THE RELATIONSHIPS BETWEEN POLLUTION AND METAL CORROSION. *(Aspects scientifiques des relations entre la pollution et la corrosion metallique). Text in French. Corrosion, 21(2):97-102, March 1973.*

Scientific studies to explore relationships between metal corrosion and water and air pollution are reviewed. The corrosivity of salts on a metal surface is primarily determined by the relative humidity, i.e., the ratio of the vapor tensions of the saline solution and the pure water. Regardless of the relative humidity, sodium nitrite fails to cause corrosion. Experiments with such salts as sodium iodide, sodium bromide, potassium nitrate, and ferric chloride demonstrated that the critical relative humidity at which corrosion starts is dependent on the nature of the specific salts, and that minute impurities in such salts modify the critical value of the relative humidity. Sulfur dioxide, present in humid air in a minimum concentration of 10-25 ppm, oxidizes to form sulfuric acid which attacks iron to form ferrous sulfate. The minimum relative humidity required for corrosion to start is 64 C. Once started, the SO2-induced corrosion goes on even in the absence of SO2 in humid air. With SO2 concentrations reaching 400 ppm, a mixture of iron sulfide and iron sulfite is likely to form.

1972

30512 **APTIC NO. 52022**

Dolezel, B.

WEATHERING TESTS OF POLYPROPYLENE. *(Odolnost polypropylenu proti pusobeni povetrnosti). Text in Czech. Koroze Ochr. Mater., 16(4):77-79, 1972. 16 refs.*

Polypropylene (PP) is considerably less resistant to the effects of the weather than polyethylene. Unstabilized PP turns yellow and brown already upon first exposure to weather. Aging further causes shrinking whose magnitude depends on the type of PP, its processing, and its shape. Mechanical properties deteriorate especially fast upon exposure to sunlight and the life of unstabilized PP does not exceed 4 months or less when exposed to the elements. The addition of antioxidants, especially of polymerized phenolic phosphites, will increase PP resistance, markedly especially in combination with dilauryl thiodipropionate. Ultraviolet light absorbers likewise will enhance PP resistance to the atmosphere, but even the best of them like benzophenone derivatives, benzotriazole, organometal compounds, and salicylic acid derivatives will not extend the life of PP beyond 5 years with constant exposure to sunlight. Also pigments act as stabilizers (titanium, zinc, or rutil oxide) in a concentration of from 1-3%. Best results were obtained with ZnO particle 0.11 micron in diameter in an amount of 10% of the weight of the polymer.

1970

30513 **APTIC NO. 51906**

Simonson, Eric Roger

EPR AND FRACTURE MECHANICS APPLIED TO OZONE CRACKING IN RUBBER. *Utah Univ., Salt Lake City, Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1970, 129p. 60 refs.*

Ozone cracking of rubber was studied on the microscopic level using electron paramagnetic resonance techniques. The degree of degradation of gum rubber compounds was approximately proportional to ozone concentration. The number of polymer chains in acrylonitrile-butadiene cleaved by ozone was linearly proportional to strain and time with an apparent threshold strain, where below that point (usually 5-11% strain) chain rupture did not increase. The number of ozone cracks per unit surface area was greater at higher strains and was attributed to an increasing number of crack nucleation sites. Correspondingly, at high crack densities, the time to failure (zero load) at constant elongation was longer than at low crack densities. An energy formulation model was constructed to predict the response of acrylonitrile-butadiene to various loading inputs, i.e., constant stress, constant strain, and cyclic strain tests. The results agreed satisfactorily with experimental data. (Author abstract modified)

EFFECTS-ECONOMIC

1973

30514 **APTIC NO. 52273**

THE COSTS FOR PASSENGER CAR TRAFFIC WORTH 45 BILLION DM TO THE CITIZENS. *(Die volkswirtschaftlichen Kosten des Strassenverkehrs. Den Buergern 45 Milliarden DM wert). Text in German. Umwelt (Duesseldorf), 3(2):30-31, 1973.*

In all places where individual passenger car traffic assumes large proportions, the car owner must understand that his right to unlimited use of his car will be drastically curbed either by prohibitions or by burdening him with the social costs of passenger car traffic which to date have been paid by the taxpayers in general. It is estimated that these social costs (including costs for cleaning devices, for reduction of the lead level, for road construction, for damages caused by noise and exhaust gases, for time losses through traffic jams, and for the loss of people through accidents will amount to 15 billion dollars in West Germany. The Los Angeles area is the first place which will seriously limit individual passenger car traffic beginning with 1975. It wants to reduce the fuel consumption in the smog-richest months of the year (May to October) to 86%. In West Germany, such drastic measures are still far off because air pollution has not reached the level of Southern California yet. To date only one law has been passed reducing the lead level in gasolines. It is hoped that this law will spur the development of new technical solutions to the exhaust gas emission problem.

30515 **APTIC NO. 51789**

Helm, Robert A.

A GENERAL PERSPECTIVE CONCERNING THE COST OF POLLUTION ABATEMENT AT ANY SPECIFIED LEVEL. *TAPPI, 56(3):126-130, March 1973.*

A simplified model of the overall effect of level of treatment on the cost of pollutant capture is presented. The model applies to the application of several conventional methods of air and water pollution control. This particular model uses common power-law functions for the interacting, and competing, factors of economies of scale and diminishing returns. Two variations of the model were developed, one for the relative total cost of state-of-the-art pollutant capture facilities, and another for the marginal or additional cost per unit of pollutant removed in the same facilities. The relative cost of capturing or treating a given amount of pollutant is known to rise with the level of treatment. This simplified model given an approximate quantitative answer to the question of how much. The cost functions are strongly enough dependent on the level of pollutant capture to emphasize the desirability of the formulation of equally broad, fundamentally-based relationships for the environmental quality benefits to be derived from such capture and treatment activities. Over realistic ranges of parameter variation, the principle of diminishing returns dominates the system and the cost per unit of pollutant captured climbs very strongly at higher specified levels of treatment. (Author abstract)

30516 **APTIC NO. 51866**

Nagai, Junichi

CONTROL OF AIR POLLUTION AND HOW MUCH IT COSTS-EXAMPLES OF CALCULATIONS FOR JAPAN IN 1985. PART I. *Chem. Economy Eng. Rev., 5(5):28-40, May 1973.*

A linear programming model was developed to provide a supply system for oil products that would keep polluting emissions within the specified limits and minimize costs. The pollutants involved are sulfur emissions from heavy fuel and substitute fuels and emissions from automotive gasoline. Preconditions for the model were the prices and availability of input resources (crude oil, imported naphtha, imported heavy fuel oil, liquefied natural gas, and nuclear energy); treatment costs in desulfurization and other pollution control units; demand for oil products in 1985; and restrictions imposed by emission standards and limitations on product properties. Total supply cost in the model or the level of sulfur discharge is given as the function. Linear programming calculations are made to minimize this function. Where cost is used as the function, it is possible to obtain a supply method that will minimize costs while limiting sulfur emission levels and satisfying the demand for oil products. In calculations using sulfur emission as the function, the extent to which total sulfur discharge in Japan can be reduced is clarified. Calculations made with respect to Japan in 1985 are given. Fuel blending, economic factors, and fuel oil properties are mentioned.

30517 **APTIC NO. 51773**

Narayanan, R. L. and Brian W. Lancaster

HOUSEHOLD MAINTENANCE COSTS AND PARTICULATE AIR POLLUTION. *Clean Air, 7(1):10-13, Feb. 1973, 8 refs.*

A project to determine the additional costs of household upkeep in an area of relatively high airborne pollution, the Mayfield area of Newcastle, New South Wales is outlined. The comparison is made with the Kotara area, which has a lesser air pollution problem. A questionnaire survey shows that the cost of maintaining a house in the Mayfield area is about $90 per year higher than in a relatively unpolluted area. The cost differential is due to the higher air pollution and dust fall. The accuracy of the cost data is questionable. The attitudes of householders may have introduced some bias. In purely economic terms, the increased cost of household maintenance is generally offset by the reduced travelling expenses to and from places of employment.

30518 **APTIC NO. 51923**

Sano, Hiroshi

EVALUATION METHODS OF NON-POLLUTION FLUES. *(Mukogainenryo no hyokaho). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(6):537-544, June 1973.*

A schematic method is discussed for evaluating a fuel in terms of combustion products. Sulfur oxides, nitrogen oxides, and particulates are the combustion products used. These elements are arranged to occupy three axes of a circle, and the degree of degradation in the environment caused by each element is represented by the length of each axes. Sulfur oxides in the exhaust are estimated from the sulfur content in the fuel. The extent of NOx and particulate emission from the fuel are also expressed on each axis. Costs of fuel, investment for combustion equipment, and operating and maintenance costs were chosen as the combustion management elements. Magnitudes of these elements are also expressed as the length of the axes assigned. Lamp oil was demonstrated to be the best commercially available fuel oil; although its cost is high, the emission of pollutants and costs of initial investment, operation, and maintenance are considerably lower than those of heavy oils. The flue gas desulfurization techniques were also evaluated. Lime desulfurization requires a large initial investment; soda desulfurization has a high operation cost. The use of high stacks, liquid natural gas, town gas, liquid petroleum gas, calorie gas, coal, combustible wastes, and electric power were similarly evaluated; the merits and shortcomings of these fuels and techniques can be readily appreciated in this manner.

1972

30519 **APTIC NO. 52289**

Cook, Earl

THE ROLE OF ENERGY IN OUR SOCIETY. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 11p., 1972. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

The U. S. energy system appears to be undergoing a major phase change, from one of rapid growth, abundance, and waste to one of lessened growth, limited scarcity, and economy. One reason for this change is the belated charging of deferred social and environmental costs to production. Health and safety protection for miners, reclamation of mined land, abatement of air pollution, and the impacts of thermal effluents are raising energy and power costs, reducing technical efficiency, and eroding net profit. Furthermore, the costs of finding and producing energy materials from deeper wells and mines are beginning to outrun the ability of new technology to increase efficiency. The capital required for the development of new energy sources could affect the capital available for investment in the rest of the economy.

1970

30520 **APTIC NO. 52263**

Netschert, Bruce C.

THE ECONOMIC IMPACT OF ELECTRIC VEHICLES: A SCENARIO. *Bull. At. Sci., 26(5):29-35, May 1970. (Presented at the International Electric Vehicle Symposium, Phoenix, Ariz., Nov. 1969.)*

The maximum possible economic impact of electric vehicles by assuming the complete electrification of rain and highway transportation is discussed. Total motor fuel consumption in highway use in 1968 was 80.9 billion gallons. The energy content of this fuel was equal to 2.96 trillion kilowatt hours, twice the actual amount of electricity generated in 1968. The effect of large scale power generation on the environment is also considered. Fossil-fuel plants emit troublesome quantities of sulfur and nitrogen oxides and raise the temperature of the bodies of water used for cooling purposes. For the railroad industry, it costs between 18,000 and 33,000 dollars per mile to electrify a rail line. Therefore, the complete electrification of the railroads of the U. S. would cost 3.8 to 7 billion dollars. The probable effect of electrified transportation on government revenues is discussed. It seems that complete conversion of highway transport is possible, but complete conversion of railroad transportation seems impossible.

STANDARDS AND CRITERIA

1973

30521 **APTIC NO. 51887**

Japan Environmental Agency, Central Pollution Control Council

ESTABLISHMENT OF ENVIRONMENTAL STANDARDS FOR NITROGEN OXIDES AND PHOTOCHEMICAL OXIDANTS. *(Chisso sankabutsu narabini kokagaku okishidanto ni kakawaru kankyo kijun no settei ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(6):633-636, June 1973.*

The average nitrogen dioxide concentration should be less than 0.02 ppm/day. The NO2 should be measured by spectrophotometry using the Saltzman reagent. Sampling should be done at a location 1.5-10 m from the ground. The environmental standards should be applied to all areas and must be attained as far as possible within the next 5 years. Photochemical oxidants are the oxidizing substances produced by a photochemical reaction, such as ozone, peroxyacetyl nitrate, and peroxides. The average photochemical oxidant concentration should be less than 0.06 ppm/day. Oxidants should be measured by spectrophotometry using a neutral potassium iodide solution.

30522 **APTIC NO. 51930**

Japan Environmental Agency

REGULATION GUIDELINES FOR URBAN AIR POLLUTANTS. *(Toshi ni okeru taiki osen busshitsu ni kansuru hantei joken to shishin). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(3):47-62, May 1973.*

Air quality standards and monitoring guidelines in urban areas are discussed in connection with the report published by the WHO Expert Committee in 1972. Experimental investigations on biological effects of urban air pollutants such as sulfur oxides, suspended particulates, carbon monoxide, oxidants, and nitrogen oxides are extensively reviewed, as well as their effects on human health and on vegetation. The critical evaluation of the review led the committee to recommend long term and short term goals for air quality standards. The British standard using filter paper is recommended to measure SOx and suspended particulates. The maximum annual mean concentration is set to 60 micrograms/cu m for SOx and 40 micrograms/cu m for suspended particulates. Ninety-eight percent of the measurements should be lower than 200 micrograms/cu m for SOx and 120 micrograms/cu m for suspended particulates. The levels are determined in terms of impairment of visibility and public nuisance caused by SOx and suspended particulates. Non-dispersive infrared spectrometry is recommended to measure CO concentration. Ten micrograms/cu m is set as the maximum mean CO concentration for 8 hr and 40 micrograms/cu m as the 1-hour maximum CO concentration. Continuous formation of 4% carboxyhemoglobin is used as a measure for the above standard. Photochemical oxidants represented as ozone should be kept lower than the 8-hour mean concentration of 60 micrograms/cu m. As the 1-hour maximum oxidant concentration, 120 micrograms/cu m is recommended. This recommendation is based on the concentration causing discomfort, eye irritation and alteration of physiological functions of the lung. Insufficient data is available at present for NOx to set the air quality standard.

30523 **APTIC NO. 51932**

Japan Environmental Agency, Bureau of Air Quality

A REPORT OF EXPERT COMMITTEE ON ENVIRONMENTAL QUALITY WITH REGARD TO SOX. *(Io sankabutsu ni kakawaru kankyo kijun ni tsuiteno senmon iinkai hokoku). Text in Japanese. Kankyocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(3):91-97, May 1973.*

The effect of sulfur oxides on environmental quality is discussed. Continuous monitoring of sulfur dioxide is by electroconductivity or lead peroxide methods. Techniques are needed to remove sulfuric acid mist and suspended particulates from the sample in order to establish a reliable monitoring system. The effects of SOx on human health are demonstrated by quoting data on mortality and morbidity increase in chronic pulmonary disease in Osaka, Yokkaichi, and Kitakyushu. The decrease in pulmonary function of schoolchildren is related to SOx concentration. The environmental SOx maximum allowable concentration should be lowered than the present 1-hour concentration of 0.04 ppm averaged for 24 hr and the 1-hour concentration of 0.1 ppm when measured by electroconductivity. The 24-hour concentration was determined to prevent chronic SOx exposure. The 1-hour concentration was determined to prevent acute SOx effects. When the above 24-hour and 1-hour standards are followed, it is possible to keep the annual mean concentration less than 0.012-0.0015 ppm, which is sufficiently low.

30524 **APTIC NO. 52115**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

GUIDANCE STANDARDS FOR DISPOSAL FACILITIES OF FACTORY EMISSION GASES (HARMFUL GASES). *(Kojo haigasu (yugai gasu) shorishisetsu shido hyojun). Text in Japanese. 10p., May 1973.*

Control criteria and methods are discussed for harmful gases such as ammonia, hydrogen cyanide, hydrogen sulfide, bromine compounds, sulfuric acid sulfur trioxide, hydrocarbons, alcohols, and acetates emitted by industries. The control emission criteria in cu cm/cu m of total emissions are 50 for ammonia, 10 for hydrogen cyanide, 10 for H2S, 10 for bromine and bromine compounds, 1 for sulfuric acid including sulfur trioxide, 200 for total volume of methanol through normal hexane with the condition that the total volume will not include more than 50 for benzene, 100 for trichloroethylene, and 100 for tetrachlorethylene. Ammonia disposal methods include scrubbing, adsorption by active carbon, and oxidation. Hydrogen cyanide and H2S can be removed by scrubbing with an alkaline solution in a packed column. Alkaline scrubbing can remove bromine and bromine compounds. A mist separator or packed scrubbing column can remove H2SO4 or SO3. Combustion, catalytic oxidation, and adsorption can remove hydrocarbons.

30525 **APTIC NO. 52124**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

GUIDANCE STANDARDS FOR OFFENSIVE ODOR PREVENTION FACILITIES. *(Akushu boshi shisetsu shido hyojun). Text in Japanese. 6p., May 1973.*

The definition and criteria of offensive odors are discussed. Measurement and control methods are mentioned. The air quality criteria are 500 or lower for the odor concentration and 27 or lower for the Order Index Number when measured at the discharge port giving a wind volume of 50 cu m/min or less. The criteria are 300 or lower and 25 or lower, respectively, when the wind volume is more than 50 cu m/min. The three-point comparison smell bag method is a good measurement method. Control methods include scrubbing, incineration, catalytic oxidation, adsorption, chemical addition, sealing, ventilation, and dilution. Other approaches to prevention of odors include improvement of working methods, use of better quality materials and fuels, concentration and integration of emission sources, and complete sealing of emission sources, and streamlining work and process control systems.

30526 **APTIC NO. 52093**

Corriveau, Martin P. and Albert F. Duzy, Sr.

REVIEW OF PERTINENT AIR POLLUTION CONTROL REGULATIONS AFFECTING FOSSIL-FUEL-FIRED STEAM GENERATION. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 23p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-F- 55.)*

The development of federal action affecting the coal mining industry and the fossil-fuel-fired steam generating power plant is discussed. Air quality standards have been established for emissions of particulates, sulfur oxides, nitrogen oxides, carbon monoxide, photochemical oxidants, and hydrocarbons. Primary standards are to be met by each state within three years of approval by the Environmental Protection Agency or by approximately mid 1975. The standards of performance for new stationaty sources set limits for fossil-fuel-fired steam generators covering smoke opacity, particulates, and oxides of sulfur and nitrogen are discussed. These apply to new equipment in excess of 250 million Btu/hr heat input. Emission limits imposed at the regional, state, or local level apply to all existing sources and new equipment having 250 million Btu/hr heat input or less, and also to contaminants not covered by federal emission limits, such as carbon monoxide.

30527 **APTIC NO. 51949**

Fri, Robert W.

ASBESTOS, BERYLLIUM, AND MERCURY. *Federal Register, 38(66): 8820-8850, April 6, 1973. 100 refs.*

In Dec. 1971, the Environmental Protection Agency proposed emission standards for asbestos, beryllium, and mercury. The bases for the determinations that these air pollutants are hazardous, the derivations of the standards now adopted, EPA s response to the significant comments received, and the principal revisions to the proposed standards are summarized. Sampling, analytical, and reporting procedures are specified for each pollutant. Exposure to asbestos dust is associated with asbestosis, bronchial cancer, and mesotheliomas, i.e., cancers of the membranes lining the chest and abdomen. The promulgated asbestos standard is applied to asbestos mills, selected manufacturing operations, the use of spray-on asbestos materials, demolition operations, and the surfacing of roadways with asbestos tailings. Visible emissions from asbestos mills and manufacturing operations are prohibited. The surfacing of roadways with asbestos tailings is prohibited, while friable abestos debris must be wetted during all stages of demolition and related handling operations. The proven effects of beryllium include both acute and chronic lethal inhalation effects, as well as skin and conjunctival effects. The lack of any mechanism for total elimination of beryllium body burden may enhance the opportunity for cancer induction. Extraction plants, foundries, ceramic manufacturing plants, and machine shops are limited to emissions of not more than 10 g beryllium/day. Rocket testing facilities are required not exceed 75 micrograms/cu m of air within the limits of 10-60 min, accumulated during any two consecutive weeks. Exposure to metallic mercury vapors may cause central nervous system injury and renal damage. The promulgated emission limit of not more than 2300 g/day applies to mercury ore processing facilities and mercury cell chlor-alkali plants. Emissions from these sources can cause ambient mercury concentrations to exceed the inhalation effects limits of 1 microgram/cu m. Standard analytical methods for these pollutants are described.

30528 **APTIC NO. 52053**

Fri, Robert W.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. PROPOSED STANDARDS FOR SEVEN SOURCE CATEGORIES. *Federal Register, 38(111):15406-15415, June 11, 1973. 4 refs.*

Performance standards and performance tests are specified for asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. Proposed particulate emission limits are 70 mg/N cu m (0.31 gr/dscf) for asphalt concrete plants and sewage treatment plants and 50 mg/N cu m (0.022 gr/dscf) for petroleum refineries, secondary lead smelters, secondary brass and bronze ingot production plants, and iron and steel plants. Carbon monoxide and hydrogen sulfide emissions from petroleum plants are limited to 0.050% by volume and 230 mg/N cum (0.10 gr/dscf), respectively. Hydrocarbon standards for storage vessels for petroleum liquids are based on liquid true vapor pressure under storage, which is 78 mm Hg or less unless the vessel is equipped with a conservation vent, 78-570 mm Hg unless the vessel is equipped with a floating roof, and in excess of 570 mm only if the vessel is equipped with a vapor recovery system. The true vapor pressure of petroleum liquids is to be monitored in accordance with the American Petroleum Institute Bulletin 2517. Particulates are to be sampled and analyzed in accordance with Test Method 5 of 40 CFR, part 60. Proposed methods for CO and H2S determinations are described. Carbon monoxide is sampled by an integrated or grab technique and analyzed with a non-dispersive infrared analyzer. Hydrogen sulfide is collected in a series of midget impingers and reacted with alkaline cadmium hydroxide to form cadmium hydroxide to form cadmium sulfide (CdS). The precipitated CdS is then dissolved in hydrochloric acid and absorbed in a known volume of iodine solution. The iodine consumed is the measure of the H2S content of the gas.

30529 **APTIC NO. 52054**

Fri, Robert W.

ENVIRONMENTAL PROTECTION AGENCY. AIR POLLUTION PREVENTION AND CONTROL. NOTICE OF ADDITIONS TO THE LIST OF CATEGORIES OF STATIONARY SOURCES. *Federal Register, 38(111):15380, June 11, 1973.*

The Environmental Protection Agency s original 1971 list of stationary sources which contribute significantly to air pollution has been revised to include asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze igot production plants, iron and steel plants, and sewage treatment plants. The affected facility at each new source category is indicated. Performance standards for the source categories have been promulgated.

30530 **APTIC NO. 52416**

Fri, Robert W.

INTERIM STANDARDS FOR 1975 MODEL YEAR LIGHT DUTY VEHICLES. *Federal Register, 38(126):17441, July 2, 1973.*

Interim standards for 1975 model year light duty vehicles and vehicle engines are presented. Emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides are given. The standards are 1.5 g/mi for exhaust hydrocarbons and 15 g/mi for exhaust carbon monoxide. The 3.1 g/mi standard for oxides of nitrogen remains in effect.

30531 **APTIC NO. 51865**

Harada, Sachio

ESTABLISHMENT OF AN ENVIRONMENTAL STANDARD FOR SULFUR DIOXIDE. *(Nisankaiou ni kakawaru kankyo kijun no settei ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(7):16-23, July 1973.*

In Dec. 1969, the Ministry of International Trade and Industry developed a plan to reduce fuel sulfur content in order to meet environmental standards. The average S content of heavy oil was to be reduced to 1.5% in Japan until 1973, then to 1.15% until 1978. In the future, the importation of low-sulfur fuel oil, the establishment of desulfurization equipment for heavy oil, the development of stack gas desulfurization technology, and the use of low-sulfur fuels such as liquefied natural gas, shall be promoted. In 1971, the sulfur content was reduced to 1.76; in 1973, 1.5% sulfur content was obtained. This improvement has improved air quality in Japan; now 87% of the Japanese monitoring stations give values below the air quality standard for sulfur compounds.

30532 **APTIC NO. 52437**

Kato, Keizo

REGULATION ON EXHAUST DUST, THE PRESENT AND THE FUTURE. *(Baijin haishutsu kisei no genjo to shorai). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(7):24-29, July 1973.*

Since dust emission standards regulate only the emission concentration without regard for the emission source, larger industries are regulated more severely than smaller ones. The standards were set on the assumption that the dust collectors such as electrostatic precipitators, bag filters, and cyclones were set up in the larger parts of the source. Areas with expecially severe pollution have special emission standards; these areas have suspended dust concentrations of 0.15 mg/cu m/yr on the average.

30533 **APTIC NO. 52459**

Kimura, Misao

TIGHTENING OF ALLOWABLE LIMITS FOR QUANTITIES OF AUTOMOTIVE EMISSION GASES. *(Jidosha haishutsugasuryo no kyogendo no kyoka ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(1):2-6, Jan. 1973.*

The automotive emissions control criteria have been enforced on new automobiles for carbon monoxide and hydrocarbons emitted as blowby gas or fuel evaporation gas and for diesel black smoke of granular substances such as soot. On the other hand, used cars are only subject to the CO emission control. The control criteria are to be considerably tightened for new automobiles produced from April 1, 1973. According to the new criteria, allowable limits will be 18.4 g/km for the average CO emission, 2.94 g/km for the average exhaust HC emission, and 2.18 g/km for the average nitrogen oxides emission, for a four-cycle gasoline engine automobile. The limits are 10.4 for CO, 2.35 for HC, and 2.19 for NOx with a liquefied petroleum gas (LPG) automobile, and 18.3 for CO, 2.34 for HC, and 0.3 for NOx with a two-cycle gasoline engine automobile. In the case of heavy-load buses and trucks, the new criteria are 1.20% for CO, 416 ppm for HC, and 1838 ppm for NOx if fueled by gasoline, and 1.1% for CO emission, 440 ppm for HC emission, and 2200 ppm for NOx emission if fueled by LPG. Stricter control criteria to be applied to new automobiles that will be manufactured from April 1, 1975 and 1976 have been recommended to the Japan Environmental Agency by the study council. They will be 2.1 g/km for CO, 0.25 for HC excluding the evaporation and blowby gases, and 1.2 for NOx from April 1, 1975, and 2.1 for CO, 0.25 for HC, and 0.25 for NOx effective 1976, all measured in terms of the average emission. The control criteria that will be applied to used cars which were manufactured when there were no applicable control criteria of this nature are still under study and will be shaped in the near future.

30534 **APTIC NO. 52052**

Kirk, Alan G., II

ENVIRONMENTAL PROTECTION AGENCY. CHRYSLER CORP. SUSPENSION REQUEST: NOTICE AND PROCEDURE FOR PUBLIC HEARING. *Federal Register, 38(114):15652-15653, June 14, 1973.*

A public hearing on Chrysler Corp. s application for suspension of the 1976 emission standard for nitrogen oxides will be held June 20, 1973, in the Environmental Protection Agency Building, Washington, D. C. Any interested person may participate in the hearing through the filing of written comments or information and by oral statement at the hearing. Participants are encouraged to discuss the technical feasibility of achieving statuatory emission standards or any proposed interim standards, and methodologies for demonstrating whether such stands are achievable on the basis of available vehicle test data and other information. Participants may, in addition, submit written requests to question directly representatives of the automotive and related industries.

30535 **APTIC NO. 52198**

Rauline, B., Maurice Ulrich, J. Belle, and Henri Charret

APPARATUSES FOR THE MEASUREMENT ON THE CARBON OXIDES CONTENTS IN ENGINE EXHAUST GASES. *(Appareils destines a mesurer la teneur en oxydes de carbone des gaz d enchappement desmoteurs). Text in French. Pollut. Atmos. (Paris), 15(57):69-71, Jan.-March 1973.*

French regulations concerning the design, verification, and operation of instruments for the measurement of carbon dioxide and carbon monoxide contents in automobile exhaust gases are presented. The instruments should be solidly built and easy to handle. The measuring ranges should be from 0 to 7% of CO, and from 0 to 15% of CO2. The instruments should have indicators with control points placed between 4 and 5% for CO, and between 9 and 12% for CO2, as well as another resetting mechanism. The full measurement value should be reached within 20 sec. The instruments should be insensitive to other components present in exhaust gas and to exhaust rate variations of about 50%. The maximum absolute error should not exceed 0.2% for CO, and 0.4% for CO2. All instruments are subject to periodical check-up.

30536 **APTIC NO. 51809**

Stockinger, H. E.

INDUSTRIAL AIR STANDARDS THEORY AND PRACTICE. *J. Occup. Med., 15(5):429-431, May 1973. 4 refs. (Presented at the Industrial Health Foundation, Annual Meeting, 37th, Pittsburgh, Pa., Oct. 10-11, 1972.)*

Nature and intent of industrial air standards are discussed. Compliance with these standards for the factory inspector is evaluated. The relationship between the three types of acceptable concentrations, the time-weighed averages, the ceiling and peak values, and the relation of the acceptable concentrations to zones of health and safety are graphically illustrated. Operational procedures for determining noncompliance are described. When monitoring is performed and evaluated in the suggested statistical manner, the determination of noncompliance is assured at the 95% confidence limit.

1972

30537 **APTIC NO. 51786**

SOME AVAILABLE ENVIRONMENTAL HEALTH CRITERIA FOR URBAN PLANNING. *World Health Organ. Tech. Rept. Ser., no. 511:15-17, 1972. 1 ref.*

A number of factors need to be considered in the development of criteria for quality of air in urban areas. Air quality criteria for urban planning should give due consideration to all known cause and effect relationships and should therefore be established with the cooperation of many professional disciplines. Most existing air quality criteria are based upon the known effects of selected air pollutants on human health, and tend to be fragmentary and limited in scope. The World Health Organization warned of the danger of extrapolating data from industrial air quality guides to formulate community air quality guides and stressed the need dor widespread and frequent measurement of pollutants, singly or in combination for establishing criteria and guides. In the U.S.A. and U.K., the standards are based on considerations of economic, epidemiological, and engineering feasibility and reflect the acceptance of threshold values below which it is unlikely that there will be demonstrable impairment of health, irritation of the sensory organs, harmful effects on vegetation, visibility reduction, or other similar effects. In the U.S.S.R., Czechoslovakia, and Poland, criteria are based on experimental toxicological evidence and on the concept that only those concentrations of pollutants in the air can be accepted as permissible that do not directly or indirectly exert harmful or unpleasant effects on man, reduce his working capacity, or have a negative effect on his physical or mental well-being.

30538 **APTIC NO. 52224**

Simon, Conrad

FEDERAL REGULATIONS RELATING TO STATIONARY COMBUSTION SOURCES. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Air Pollut. Control Assoc., Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Edison, N. J., 1972, 15p. 4 refs. (May 12.)*

Environmental Protection Agency performance standards for fossil fuel-fired steam generators (greater than 250 million Btu/hr heat input) and incinerators (capacity greater than 50 tons/24 hr) are presented. The particulate standard for steam generators is equivalent to a stack concentration of about 0.06 grains/standard cu ft corrected to 15% excess air. It is based primarily on the actual performance of seven coal-fired plants equipped with high-efficiency electrostatic precipitators. The lime/limestone scrubbing process can be used to achieve new source standards for sulfur dioxide. The standards for nitrogen oxides are based on combustion process modifications such as flue gas recirculation, nonstoichiometric combustion techniques, low excess combustion air, and reduced combustion preheat. The only standard for incinerators is for particulate emissions. It is equivalent to 0.08 grains/standard cu ft corrected to 12% carbon dioxide. Electrostatic precipitators, fabric filters, and high-energy scrubbers provide sufficient control to meet the standards. Emission monitoring is required for generators, while incinerators must obtain and retain particulate measurements from stack sampling. Standard methods and devices for stack testing are described.

LEGAL AND ADMINISTRATIVE

1973

30539 **APTIC NO. 52144**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

DESIGNATION OF SPECIFIC CONTROL AREAS AND ESTABLISHMENT OF CONTROL CRITERIA BASED ON OFFENSIVE ODOR CONTROL LAW. *(Akushu boshiho ni motozuku kiseichiiki no shitei oyobi kiseikijun no settei ni tsuite). Text in Japanese. 15p., May 1973.*

The control criteria and standards established by the Japanese Offensive Odor Control Law and the Tokyo criteria and standards proposed on the basis of the national law are discussed. The basic law designates ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethyl amine as offensive odorants. The law authorizes Prefectural governors to designate, change, and abolish control areas. Odor intensities are classified into six grades; the zero grade is odorless, grade five gives the most intensive smell. Odor concentrations should correspond to grade 2.5 or lower, excepting some areas where they may be 3.5 depending on the adaptability of local residents to such odors. A 1 ppm concentration of ammonia corresponds to grade 2.5; 2 ppm corresponds to grade 3; 5 ppm corresponds to grade 3.5. For methyl mercaptan, the grades 2.5, 3, and 3.5 correspond to 0.002 ppm, 0.004 ppm, and 0.01 ppm, respectively. These grades are 0.02, 0.06, and 0.2, respectively, for hydrogen sulfide. They are 0.01, 0.05, and 0.2, respectively, for methyl sulfide. They are 0.005, 0.02, and 0.07, respectively, for trimethyl amine. The Tokyo Metropolitan Government designated its entire mainland area as the offensive odor control area. The control criteria for industrial and semi-industrial areas are 2 ppm for NH3, 0.004 for methyl mercaptan, 0.06 for H2S, 0.05 for methyl sulfide, and 0.02 for trimethyl amine.

30540 **APTIC NO. 51950**

Bernstein, George K.

APPROVAL OF PLAN REVISIONS. *Federal Register, 38(68):9088, April 10, 1973.*

Five proposed revisions to the Massachusetts State plan for implementation of national ambient air quality standards have been approved by the Environmental Protection Agency as consistent with the requirements of the Clean Air Act and 40 CFR part 51. Four of the revisions will permit the following sources, all in regions classified priority I for sulfur oxides, to burn 2.2% sulfur fuel for limited periods instead of 1% sulfur fuel required by regulation 5.1.2: Deerfield Specialty Papers, Inc. and Stevens Paper Mills, Inc., in the Hartford, New Haven, Springfield region; Hollingsworth and Vose Co., in the Boston region; Pepperall Paper Co., in the Merrimack Valley region. The fifth revision will permit Tileston and Hollingsworth Co., also in the Boston region, to burn 2.2% sulfur fuel for a limited time instead of the 0.5% required by regulation 5.1.1.

30541 **APTIC NO. 51819**

Burton, Ellison S., Edward H. Pechan, and William Sanjour

SOLVING THE AIR POLLUTION CONTROL PUZZLE. *Environ. Sci. Technol., 7(5):412-415, May 1973. 5 refs.*

Several key requirements for the development of a methodology for analysis of regional air pollution abatement are presented. In regions containing many sources, the systematic examination of proposed abatement strategies can be aided by computer modeling systems. Such systems require a large data input and contain several separate models. Framework for air pollution control is described. Micromodel is described to assist state governments in preparing implementation plans for control of sulfur oxides and particulate matter. The model has been able to provide results useful to federal, state, and urban agencies in developing abatement implementation plans. Results are presented for New York and Philadelphia. A large increase in the quantities of low-sulfur fuels occurred because switching to low-sulfur fuels was the least expensive option for many sources.

30542 **APTIC NO. 51815**

Dibelius N. R. and W. F. Marx

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER-GENERATING EQUIPMENT. *Mech. Eng., 95(3):76-80, March 1973.*

A summary of Federal environmental legislation and regulations which have been enacted pertaining to gas, steam, and combined gas and steam-turbine power generating equipment is presented. Air quality control regions, national ambient air quality standards, state implementation plans, and national performance standards for new stationary sources are described. The national standards for new fossil-fuel-fired steam generating units of more than 250 million Btu/hr heat input are presented. Data for particulate matter, sulfur dioxide, and nitrogen oxides are presented. Environmental laws and regulations are changing rapidly and must be followed closely during the next few years.

30543 **APTIC NO. 52036**

Donovan, Peter A.

ENVIRONMENTAL LAW GROWING APACE: AN INTRODUCTORY COMMENT. *Boston Coll. Ind. Commer. Law Rev., 14(4):575-582, April 1973. 90 refs.*

During the 1960 s, there was a tremendous growth in public awareness of and concern with the dangers of environmental pollution. Consequently, the 1970 s will be a decade of growing concern with the legal aspects of environmentalism. This concern is already being made manifest in the enactment of new laws and an increase in environmental litigation.

30544 **APTIC NO. 52106**

Dreese, Richard G. and Harold L. Bryant

ECONOMIC IMPLICATIONS OF STRIP MINING LEGISLATION: THE SMALL FIRMS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 26p., 1973. 24 refs. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-F-15.)*

The impact of surface mine legislation on the structure of the coal mining industry in Ohio and specifically on one small stripping firm in Ohio is investigated. Trends in the coal mining industry over the last two decades strongly indicate that there are economics of scale in producing coal that have given large firms a comparative advantage over small firms even without the added burden of reclamation costs. Ohio passed a new strip law in 1972 which requires higher bonding and more extensive reclamation than the 1965 law. It is expected that the new law will significantly increase the cost per ton of strip mined coal. The economic analysis of the effects of rigid legislation or abolition is largely unknown at this time to economists or legislators since the empirical evidence on many aspects of stripping is meagre. Reclamation costs are known to vary widely from area to area and from state to state, and the costs of reclamation under many of the new laws or newly changed laws have not been estimated by many coal firms. Legislation limiting sulfur content in coal will hurt firms in some localities and promote growth of output in other areas. Air pollution legislation has caused shifts to non-coal energy sources.

30545 **APTIC NO. 52313**

Eisenach, Edwin J.

THE AMAX ENVIRONMENTAL EFFORT. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 4p., 1973. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 102nd, Chicago, Ill., Feb. 25-March 1, 1973.)*

Environmental problems and the control efforts in the mining industry are discussed. One fundamental in the problem-solving process is to try to understand as much as possible about the nature of the opposition. The formal corporate organization of American Metal Climax (AMAX) to deal with control problems began with the establishment of the environmental planning and protection committee. The handbook is designed to be at least a starting point reference source on hopefully pertinent environmental subject matter. It is intended as a repository for legislative and technical reports and for a periodically published report on trends in the environmental area as they may affect the company.

30546 **APTIC NO. 51975**

Ferrar, T. A.

AIR POLLUTION ABATEMENT: AN EXAMINATION OF THREE POLICIES. *CRC Critical Rev. Environ. Control, 3(2):121-128, Feb. 1973. 5 refs.*

Three economic policies for inducing control of environmental pollution are discussed. The first method is the linear effluent taxation policy. This incentive structure is perhaps the most widely advocated procedure among economists for inducing pollution abatement to the level required by a set of quality standards. The second administrative policy is referred to as a property right allocation or direct discharge restriction system. The third policy is a nonlinear effluent taxation policy. All three methods provide identical results at equilibrium. However, it is the dynamic (disequilibrium) characteristics which provide meaningful differentiation among the alternatives, and the dynamic characteristics of nonlinear (progressive) tax structure provide the trade-off for its added complexity. The decision as to the enforcement technique to implement must depend on the pecularities of the air basin in question, and the dynamic aspects of any control strategy must be considered in this decision process.

30547 **APTIC NO. 52280**

Fri, Robert

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED RECLASSIFICATION OF AIR QUALITY CONTROL REGIONS. *Federal Register, 38(110):15180-15191, June 8, 1973. 3 refs.*

The reclassification of Air Quality Control Regions was proposed by the Environmental Protection Agency. Of 47 regions originally classified priority I, EPA has proposed to reclassify 43 as priority III and to retain the priority I classification in four cases. The reference methods used for the measurement of ambient air concentrations of nitrogen dioxide are discussed and reclassification procedures reviewed. Motor vehicle emission standards, and transportation and land use controls, as well as changes in the nitrogen dioxide standards are reviewed for Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, the District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.

30548 **APTIC NO. 52283**

Fri, Robert

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. MISCELLANEOUS AMENDMENTS. *Federal Register, 38(124):17129-17168, June 28, 1973.*

Various technical amendments and changes of the motor vehicle and motor vehicle engine regulations are described and discussed. Emission regulations for new gasoline-fueled light duty vehicles, their general applicability and definition, hearings on certification, the maintenance of records, and emission standards for 1974 model year vehicles are reviewed. Maintenance, mileage accumulation and emission measurements, test procedures, gasoline fuel specifications, vehicle and engine preparation, dynamometer procedures, and regulations applicable to the above are presented. Designs and regulations for three-, four-, and five-speed manual transmissions and for automatic transmissions are included.

30549 **APTIC NO. 51782**

Fri, Robert W.

RESEARCH AND DEMONSTRATION GRANTS. INTERIM REGULATIONS. *Federal Register, 38(93):12784-12789, May 15, 1973.*

Interim regulations are promulgated to publish a new codification for Environmental Protection Agency research and demonstration grant regulations which supplement the general grant regulations. Publication of these regulations is a continuation of an effort to coordinate and conform grant award and administration policies, procedures, and terms for the various EPA grant programs, to improve administration of these grant programs and to furnish applications, grantees, and the public with a more explicit statement of grant award and administration requirements.

30550 **APTIC NO. 52281**

Fri, Robert W.

LIMITATION OF ILLINOIS IMPLEMENTATION PLAN TO METROPOLITAN CHICAGO INTERSTATE REGION. *Federal Register, 38(127):17726, July 3, 1973.*

An amendment of the Illinois state implementation plan of the Clean Air Act is presented. The original implementation plan was disproved because the Illinois regulation establishing emission standards and limitations for fuel combustion emission sources using solid fuel exclusively did not meet the requirements. Disapproval was inappropriate, since the unenforcability of the regulation occurred only in the Metropolitan Chicago Interstate Region. It was determined that the regulation would be effective as of July 3, 1973.

30551 **APTIC NO. 52282**

Fri, Robert W.

ANALYSIS OF POLLUTANTS. PROPOSED TEST PROCEDURES. *Federal Register, 38(125):17318-17323, June 29, 1973. 11 refs.*

Proposed test procedures for the analysis of pollutants are discussed. The applicability, definitions, and identification of necessary procedures are described. The application for alternative test procedures, and the need for alternative and additional test procedures are reviewed. The determination of a median and range of values and a previously unpublished test procedure for analyzing pesticides and chlorinated hydrocarbons are presented.

30552 **APTIC NO. 52414**

Fri, Robert W.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 38(127):17737, July 3, 1973.*

A substitute regulation was proposed to correct deficiencies where compliance schedule portions of the Illinois implementation plan were disproved by the administrator. The proposed schedule is categorical in nature and is consistent with the previously approved or promulgated final compliance dates and ambient air quality attainment dates in the plan. It is based on technical data available to the administrator. This schedule relating to particulate emissions from fuel-burning sources would require each source to notify the administrator whether it intends to meet the applicable emission limitation through stack gas cleaning or fuel switching. A public hearing will be held on the opposed compliance schedule.

30553 **APTIC NO. 52417**

Fri, Robert W.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS FOR CERTAIN STATES. *Federal Register, 38(126):17682-17704, July 2, 1973.*

State and local implementation plans for the control of air quality are presented for Kansas, Louisiana, Missouri, California, Indiana, Massachusetts, Minnesota, and Ohio. Air quality control programs, implenentation of control measures for stationary and mobile sources, inspection and maintenance programs, and control alternatives are reviewed. The economic and social impact of the proposed regulations are discussed.

30554 **APTIC NO. 52474**

Fri, Robert W.

PROPOSED APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. NEW JERSEY, PENNSYLVANIA, TEXAS. *Federal Register, 38(127): 17782-17811, July 3, 1973.*

New Jersey, Pennsylvania, and Texas state implementation plans of the national ambient air quality standards are presented. Pollution in the New Jersey portions of the New Jersey-New York- Connecticut region and the Philadelphia metropolitan region are reviewed, along with control methodology, current studies, proposed controls on stationary and mobile sources, and the economic and social impact of the New Jersey transportation control plan. A compilation of control strategy effects is presented; and daylight delivery ban regulations, a motorcycle limitation program, gas limitation regulations, the control of dry cleaning solvent evaporation, storage of petroleum products, paint and varnish operations, and Federal compliance schedules are discussed. The Pennsylvania implementation plan is presented. Transportation control alternatives, additional control strategies, control of mobile sources, implementation procedures, the economic and social impact, direct costs to automobile owners, tax revenue implications, and various studies and guidelines are reviewed. The Texas implementation program is presented, along with various control strategies for stationary and mobile sources in the areas of Houston-Galveston, Austin, Dallas-Fort Worth, San Antonio, and El Paso. The socio-economic impact and efforts to mitigate the effects of proposed regulations are reviewed.

30555 **APTIC NO. 51787**

Hashimoto, Michio

THE ROLE OF THE PHYSICIAN IN CHARGE OF PUBLIC HEALTH IN ENVIRONMENTAL HEALTH. *(Kankyo hoken ni okeru koshu eisei ishi no yakuwari). Text in Japanese. Koshu Eisei (Public Health), 37(5):307-314, May 1973.*

Public nuisance including air pollution has been a threat to human health in Japan. Disastrous water pollution and air pollution incidents which occurred in the past decade have cost many lives and injuried many people. The air pollution incident which occurred at the petroleum complex area in Yokkaichi city was first revealed by the residents and the physicians who treated them. After a long fight by the organized residents and physicians, the administration became aware of the serious effect of the toxic substances in air. A new environmental standard of sulfur oxides was issued in 1969 and is expected to be revised in 1973. Physicians are expected to play a more important role in the future in monitoring environmental pollutions.

30556 **APTIC NO. 52105**

Heckard, John M.

THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR INDUSTRIAL PROJECTS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 11p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-I-77.)*

The National Environmental Policy Act stipulates that Environmental Impact Statements (EIS) must be submitted for major actions significantly affecting the quality of the human environment. To date, some 500 EIS s have been submitted by the Federal agencies themselves. A four-phase approach to the preparation of EIS is discussed. The procedures by which various types of environmental data are collected for the analysis of impact are presented. The four steps such as preliminary assessment, data collection, analysis, and report finalization are described for the preparation of an EIS. The success of a interdisciplinary environmental analysis depends largely upon the project organization and the types of investigators which are available to respond to the investigation. In most cases a rather simple project organizational structure works best.

30557 **APTIC NO. 52352**

Inoue, Rikita

THE ROLE OF SANITARY TECHNOLOGY -- FOCUSING ON AIR POLLUTION CONTROL. *(Eisei kogaku no yakuwari -- Taikiosen boshi o chushin to shite). Text in Japanese. Koshu Eisei (Public Health), 37(2):107-110, Feb. 1973. 2 refs.*

The role of sanitary technology in air pollution is discussed. Sanitary technologists define the air quality goal with the cooperation of public sanitarians and biologists on the basis of the influence evaluation and design control methods at emission sources. They also are involved with planning city design, green areas, and monitoring networks. The selection of an index, measuring method, investigating method, and statistical method must be consistent.

30558 **APTIC NO. 51962**

Knabe, W.

ON THE ESTABLISHMENT OF PROTECTIVE FORESTS FOR AIR POLLUTION CONTROL. *(Zur Ausweisung von Immissionsschutzwaldungen). Text in German. Forstarchiv, 44(2):21-27, Feb. 1973. 28 refs.*

Forests can be used to absorb air pollution. Zones in the North Rhine Westphalia area include overload, load, screening, and outersink zones. The overload zones are the industrial centers with high-level pollution of the atmosphere. In this zone, the most coniferous species will not grow, or if they do, their filtering effect will be greatly reduced. In load zones, sulfur dioxide as indicator of gaseous air pollution occurs only in exceptional cases in acutely toxic concentrations. The relatively high dust fall in this zone, to which humans generally react more than plants, cultivation of resistant coniferous trees is possible and necessary for dust retention. The zone includes all areas characterized by long-term emission concentrations of dust above 0.65 g/sq m day, of sulfur dioxide above 0.40 mg/cu m, and of fluoride above 2.50 micrograms/cu m. Screening zones are usually located on the leeward side of large industrial centers. In this zone, SO2 concentrations between 0.2 and 0.4 mg/cu m can still be measured frequently in winter. In the outer sink zone, the pollutants are highly diluted.

30559 **APTIC NO. 51985**

Kroon, Dirk Jan

THE NATIONAL AIR POLLUTION MONITORING NETWORK IN THE NETHERLANDS. *Chim. Ind. (Milan), 55(1):49-52, Jan. 1973. (Presented at the Giornate della Chimica, Milano, Italy, April 20, 1972.)*

Traffic, industry, and high population-density make air pollution a severe problem in the Netherlands. Inversion layers are not uncommon and smog situations have been observed in the Rotterdam area. The air pollution monitoring network in the Netherlands is described. The principal components that will be monitored in the automatic network are sulfur dioxide, nitric oxide, nitrogen dioxide, ozone, and carbon monoxide. Later aerosols and fluorides will be added. The SO2 network in Rijnmond has given good results in the measurement and thus proved its effectiveness as a means of controlling industrial pollution. The five-component monitors will also provide information on other sources of pollution, such as motor traffic. It will be possible to distinguish air pollution from different types of sources accurately. By making very fast signalling possible, the system will contribute to the general prevention of undue pollution.

30560 ***APTIC NO. 52099***

Luneburg, William V.

FEDERAL-STATE INTERACTION UNDER THE CLEAN AIR AMENDMENTS OF 1970. Boston Coll. Ind. Commer. Law Rev., 14(4):637-670, April 1973. 165 refs.

The 1970 Clean Air Amendments to the Clean Air Act created a multitude of questions pertaining to the interrelationship of state and federal law in the area of air pollution control. The extent to which state interpretations of regulations contained in air quality implementation plans are binding on the federal government, the extent to which federal law permits states to revise implementation plans, the status as federal law of state regulations submitted to and approved by the Environmental Protection Agency when the state agency s adoption of the regulations exceeded its authority, state enforcement of federally promulgated implementation plans, and the limits of the Environmental Protection Agency s power under the Clean Air Amendments to revise the legal authority of state agencies to control air pollution, are examined. Permitting states a relative degree of freedom to adjust their programs to problems as they arise, and creating opportunities for increased participation by the states in air pollution regulation, may avoid unnecessary federal-state friction. (Author conclusions modified)

30561 **APTIC NO. 52354**

Minakami, Sachihiro

COUNTERMEASURES AGAINST BAD ODORS IN SAPPORO CITY -- TRANSFER OF A MEAT PROCESSOR. *(Sapporo-shi no akushu taisaku -- kaseijo iten no jirei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(6):534-538, June 1973.*

Sources of bad odors in Sapporo include livestock housing, meat processing, fish processing, marine products manufacturing, chemical factories, and drain treatment facilities. Some of these industries are being moved away from the area to reduce odor levels. The establishment of new industries which might produce odors is restricted and improved odor control methods are encouraged. The results of these control programs will be determined in the near future.

30562 **APTIC NO. 52104**

Pratt, Robert N

LEARNING THE LESSONS OF THE ENVIRONMENTAL ERA. *Preprint, American Inst of Mining, Metallurgical, and Petroleum Engineers, New York, Society of Mining Engineers, 16p., 1973. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, Chicago, Ill., Feb. 25-March 1, 1973, Paper 73-B-87.)*

The phenomena of environmental reform over the present years is examined. The body of law embracing environmental quality control grows each day, becomes more complex, and offers more contradictions. The economic significance of enacted and proposed environmental regulation is pressing management in the mining industry to some hard decisions. It is suggested that an independent, expert organization should be created to review technical information used by governmental agencies to be sure it is sound and accurate before rules are based on it. The standards are proposed and discussed.

30563 **APTIC NO. 52063**

Schachter, Esther Roditti

SOME CRITERIA FOR EVALUATING STATE AND LOCAL AIR POLLUTION CONTROL LAWS. *Boston Coll. Ind. Commer. Law Rev., 14(4):583-636, April 1973. 285 refs.*

An analysis of the air pollution control laws in the New York-New Jersey metropolitan region is given in an effort to stimulate an understanding of existing state and local codes and the potential effectiveness of new and stronger codes. The analysis focuses on public policy statements; definition of terms, emission standards; banning of activities, material, and equipment; equipment and operator licensing; enforcement devices and remedies; and civil and criminal penalties. Legislation is reviewed, enforcement experiences are described, and legislative criteria for judging the potential effectiveness of traditional air pollution control laws is presented. (Author introduction modified)

30564 **APTIC NO. 52215**

Schwarz, O.

BRIEF REPORT CONCERNING THE ACTIVITY OF THE VGB TECHNICAL ASSOCIATION OF LARGE POWER PLANT OPERATORS. E. V. 1972/1973. *(Kurzbericht ueber die Taetigkeit der VGB Technische Vereiningung der Grosskraftwerksbetrieber E. V. 1972/1973). Text in German. VGB Kraftwerkstechnik, 53(6):347-352, June 1973.*

Among other things, the Association of large power plant operators has been active in the field of air pollution. Considerable progress was achieved in the past 20 years concerning dust collection. The dust emission could be reduced to less than 1/4 of the emission of 1950, although power generation increased to six times that in 1950. A work group concerned with sulfur dioxide emission is preparing a system analysis for comparison of the technologies for fuel and flue gas desulfurization. (Air pollution mentioned on page 349.)

30565 **APTIC NO. 51943**

Tunnicliffe, M. F.

THE INTERPRETATION OF BEST PRACTICABLE MEANS. *Chem Engr. (London), 9(271):121-124, March 1973. (Presented at the Institution of Chemical Engineers, London and South Eastern Branch, Emissions to the Air Symposium, London, England, Nov. 9, 1972.)*

The best practicable means requirement of the Alkali Act covers noxious or offensive gases and particulates. One definition of practical means accepted by the Alkali Inspectorate implies regard to local conditions, financial implications, and the current state of emission control technology. The requirement also applies to the manner in which control appliances are used and to the proper supervision, by the owner, of any operation in which emissions are evolved. A large part of the regular work of Inspectors in the field is closely linked to the three areas of efficient maintenance, proper use, and process supervision. On routine visits Inspectors will discuss maintenance schedules, and where necessary, their implementation. Emission testing by the Inspectorate is carried out to assess whether proper process control or efficient prevention of emissions is being achieved and maintained. The regular testing or monitoring of emissions by industry is also becoming part of the best practicable means. The Inspectorate is alert to new technology developments coming into wide use in other countries, particularly developments in the chemical, metallurgical, and fuel industries that predominately form the scheduled works under the Alkali Act.

1972

30566 **APTIC NO. 52026**

Toyama Prefecture (Japan) Public Nuisance Center

ANNUAL REPORT ON POLLUTION CONTROL ACTIVITIES. NO. 1. 1971 AND 1972. *(Gyomu nenpo, daiichigo. Showa 45, 46 nendo). Text in Japanese. 267p., Dec. 1972.*

The Toyama Prefecture Public Nuisance Control Center was constructed in June 1970, and further expanded and moved into a newly constructed Prefectural Government Office building in Aug. 1972. The Center comes under the jurisdiction of the Department of Environmental Protection of the Prefectural government. The physical structure of the center consists of an automatic and continuous air pollution monitoring room on the top floor, the pollutant chemical analysis room, the air pollution experimental lab, the standard gas experimental lab, an air analysis room, an odor experimental lab, and various other analysis rooms. There are similar but smaller labs for water pollution and solid waste. The center is staffed by 31 persons. This annual report presents a comprehensive study and statistics compiled by the center including special investigations in various areas with air pollution problems, investigation of fluoride gases, investigation of complaints by questionnaires, measurements of soot, dust, and suspended particulates in various electric furnace areas, inspections of designated factories, measurements of fuel sulfur content, inspections of toxic gas emission facilities, the records of continuous monitoring on settling particles and sulfur oxides, studies on heavy metal pollutants in the air, studies on particulate sizes and crystalizations, and investigations on automotive emissions. The area's suspended particulates average from 0.100 mg/cu m in the busiest center city and factory areas to 0.06 mg/cu m of suburban agricultural areas.

30567 **APTIC NO. 52376**

TRW Inc., McLean, Va., Transportation and Environmental Operations

STRATEGIES FOR THE PHILADELPHIA TRANSPORTATION CONTROL PLAN. *12p., Oct. 24, 1972.*

Development of a transportation data base, an air quality data base, and strategy application data is described. Definition of control strategies, analysis of the impact of strategies on air quality, and formulation of a surveillance review process are presented. Preference ranking of the control measures proposed for each strategy, giving considerations to existing legal and institutional constraints, federal and state funding mechanisms, economic impact, and existing transportation systems are discussed. Mobile source emission levels are calculated for the base year 1971 and projected to 1977 by multiplying base and projected daily vehicular miles traveled by an emission factor in grams of carbon monoxide per mile traveled. Control strategies include inspection, maintenance, retrofit controls, gaseous fuels, electrification, and mass transportation.

30568 **APTIC NO. 52016**

Cho, Ping

A SCHEME FOR ALLOCATION OF EMISSIONS IN URBAN AREAS. *Northwestern Univ., Evanston, Ill., Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972. 193p. 86 refs.*

The concentrations of particulate matter at the centers of two regions in Chicago were calculated using a two-dimensional Gaussian dispersion model. A comparison of the calculated 24-hour average concentrations of particulate matter with actual measurements for two 7 sq mi regions in Chicago for each of two days typical of episode periods was made. Differences were systematic and attributed to natural background and in situ particle formation. A scheme of emissions allocation for air pollution control was developed for 7 sq mi region in the Hyde Park area, Chicago. Input data used for emissions allocation include: the source inventory for the area of interest; a typical set of meteorological parameters such as bi-hourly wind speed, wind direction, and mixing height during episodes were generated stochastically from the historical data; cost functions for three type of emission sources (11 point sources and 37 area sources) identified for the study area were obtained from the open literature; the predetermined air quality goal is based on the primary standard of 260 micrograms/cu m as a maximum 24-hour average concentration of particulate matter not to be exceeded during episodes in accordance with the proposed National Air Quality Standards. The cost for control of selected sources of emissions in a module and for uniform control of all sources of emissions in a module were evaluated by mathematical programming techniques. The selective control strategy was examined, using linear and quadratic cost functions; the uniform control strategy, by a simple mathematical analysis. Using linear cost functions in a linear programming model, the estimated annual cost for uniform control was approximately 15 times greater than the cost associated with the use of selective control. When the annual cost for selective control is based on quadratic cost functions instead of linear ones, a further reduction in annual cost by a factor of three was obtained. An emissions allocation scheme based upon both selective control and uniform reduction is proposed. The dual formulation of the linear programming problem for the selective control strategy is discussed and its economic implications to air resources management are given. (Author abstract modified)

30569 **APTIC NO. 51805**

Dunlop, J. M.

ENVIRONMENTAL HEALTH--STRUGGLE FOR SURVIVAL. *Public Health (London), 86(6):313-324, Sept. 1972.*

A reorganization of the public health services in England is proposed. On the national level, there should be specialist inspectors under one department, instead of the present system where responsibility is spread out over local authorities and diverse national departments. This would eliminate the problems that occur when local governments are called upon to be both the prosecutor and the defendant in legal matters concerning public health. A laboratory and committee should be established to check factory practices and products for health risks, and stop them if necessary. Everyone involved in health services could be required to attend a refresher course in the subject every five years. A health study circle, in which doctors, chemists, public health inspectors, lawyers, physicists, planners, and a chairman would work together to deal with matters of public health, would be set up. On the regional level, specialist inspectors would deal with those aspects of public health concerning water (port inspectors, and effluent control, for example). Specialist inspectors at the area level would deal with those aspects of public health concerning the land, including food.

30570 **APTIC NO. 51978**

Ellis, Howard M. and Ralph L. Keeney

A RATIONAL APPROACH TO GOVERNMENTAL DECISIONS CONCERNING AIR POLLUTION. *J. Syst. Eng., 3(1):19-33, 1972. 32 refs.*

A problem common to many government agencies is how to specify a regulatory policy that is in some sense best for a given situation. Such questions demand the consideration of: multiple conflicting objectives; nonrepeatable uncertainties; costs and benefits accruing to various individuals, businesses, and organizations; and effects which extend far into the future. A systematic approach, known as decision analysis is described, appropriate for analyzing such problems. The specific problem involves determining the maximum legal sulfur content of fuels burned in New York City. From the point of view of a city administrator, seven major objectives are identified for this problem. These include physical and psychological health effects on residents, the economic consequences to both residents and the City, and political implications. Measures of effectiveness are specified for each objective, and the possible consequences of lowering the legal sulfur content of fuels from 1.00 to 0.37% are assessed in terms of these measures of effectiveness. The impact of this application of decision analysis on the thinking of individuals responsible for air pollution control programs is described. (Author summary modified)

30571 **APTIC NO. 51798**

Giles, Robert H., Jr.

A PROTOTYPE URBAN ENVIRONMENTAL POLICY STATEMENT. *J. Environ. Syst., 2(4):305-310, Dec. 1972. 5 refs.*

Many communities now seek an environmental policy statement to serve as a guide for citizens as well as legislators and administrators. The motivation to gain such guides is a product of rapidly declining quality of the urban milieu, new perception of the problem by the masses aided by many media, and mandates from the urbanizing professions and a dawning of the potentials for really doing something about the problems. While policy statements may provide guidance and education for citizens and corporation, its mega-influence may be felt if it suffices in lieu of arduous legislative development or serves as the final criterion for environmental legislation. Such policy statements as goal concepts can provide the basis and foundation for the urban environmental system. The prototype of such a policy statement is presented for use and discussion. (Author abstract modified.

30572 **APTIC NO. 52375**

Hardy, George E., Jr., Paul Pate, Charles B. Robison, and W. T. Willis

THE FIRST USE OF FEDERAL CLEAN AIR ACT EMERGENCY AUTHORITY: A LOCAL ANALYSIS. *Preprint, American Public Health Assoc., 15p., 1972. 15 refs. (Presented at the American Public Health Association, Annual Meeting, 100th, Atlantic City, N. J., Nov. 5, 1972.)*

A temporary restraining order of the U. S. Government in Nov. 1971, against industrial pollutors in Jefferson County, Alabama is discussed. This paper describes the chronological order of events leading to this historic use of the injunctive authority granted in the 1970 Federal Clean Air Act and describes the subsequent development of local episode abatement strategies. Pre-planned abatement strategies are an invaluable tool in reducing pollution emissions, thereby hopefully avoiding a repetition of the events of Nov. 1971.

30573 **APTIC NO. 51846**

Kohayakawa, Takashi

ANTI-POLLUTION MEASURES. II. *Ingrs. Automobile (Paris), 10(27): 547-551, Oct. 1972.*

Japan s Anti-Pollution Basic Laws cover air pollution, water pollution, vibration, noise, odor, and ground settlement; they specify environmental standards necessary for preserving human life and health and require that the standards be met. Exhaust gas regulations for control of carbon monoxide, nitrogen oxides, hydrocarbons, particles, and diesel smoke are enforced by a 4-mode chassis dynamometer test in which instantaneous levels of CO and HC are recorded by a nondispersive infrared analyzer. The maximum allowable exhaust emission (average of 4 modes) is 2.5%. Under the environmental standards for exhaust emissions, average hourly CO values are limited to 20 ppm for 8 consecutive hours or to 10 ppm for 24 consecutive hours. Nitrogen dioxide and lead levels will be added to the standards in 1972 and 1973, respectively. Subsequently, levels of oxidants and other pollutants will be specified. Anti-CO measures include the development of an idle limiter, improvements in production and control engineering for reducing the scatter of carburetor performance flow rate, and the application of a temperature adjuster to an injection, which maintains a constant fuel-air ratio. Anti-HC measures include installation of blow-by recirculation devices and anti-evaporation devices. To meet increasingly stricter regulations, the use of purifying devices such as catalytic converters, thermal reactors, and afterburners has become necessary.

30574 **APTIC NO. 51804**

Weaver, Neil K.

THE ROLE OF THE OCCUPATIONAL PHYSICIAN IN POLLUTION CONTROL PROGRAMS. *J. Occup. Med., 14(11):836-838, Nov. 1972. 14 refs. (Presented at the Industrial Medical Association, Annual Meeting, 57th, Philadelphia, Pa., April 18, 1972.)*

The relationship between occupational medicine and environmental medicine is discussed. The physician in industry has experience and knowledge concerning health implications of the worker. These encompass a wide spectrum of information, and may include such diverse items as the safety factors involved in a four-hour exposure to toluene at 85 ppm in a workroom air during a solvent cleaning operation. A review of the industrialization process in relation to the evolution and growth of mankind is presented. The influence of occupational medicine upon pollution control is described. The primary concern of the occupational physician has been the health of the worker and the hygienic conditions of the workplace. Research capabilities of occupational medicine in relation to pollution control are described.

1971

30575 **APTIC NO. 52230**

Bellport, B. P. and F. Asce

USBR SPECIFICATIONS FOCUS ON ENVIRONMENT. *Civil Eng. (N. Y.), 41(7):50-52, July 1971.*

Bureau of Reclamation specifications are increasingly calling for firmer control of contractor operations that affect the environment. Provisions for the preservation of the landscape, prevention of water pollution, and/or dust abatement are included in the specifications for Cutter Dam, Pueblo Dam, Hunter Tunnel, the Twin Meadows aggregate processing plant, McClusky Tunnel, and Strawberry Aqueduct. The Cutter Dam specifications reflect the latest requirements on air pollution and dust abatement. In storing and handling cement and pozzolans, the contractor must prevent discharges of dust to the environment. In addition, vehicles showing excessive exhaust gas emissions cannot be operated until corrective repairs or adjustments are made. Burning of cleared trees, combustible materials, and rubbish is permitted only when atmospheric conditions are favorable. Antipollution provisions are adhered to in the construction of the Twin Meadows aggregate processing plant. Raw material is moved by dragline to the crusher feed belt and from there by conveyor belt a screener-washer unit. Conveyor belts also move aggregate to storage areas; sand is moved as a slurry to a final processing unit where it is automatically washed and separated into usable and nonusable sizes. Specifications for a second aggregate facility include provisions for settling ponds and restoring the appearance of the aggregate source site.

1970

30576 **APTIC NO. 51912**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN ATLANTA INTRASTATE AIR QUALITY CONTROL REGION (GEORGIA). *APTD-1192, 70p., Jan. 1970.*

NTIS: PB 214957

This report proposes boundries for the Atlanta Intrastate Air Quality Control Region in accordance with the Clean Air Act and discusses the factors underlying the proposed boundries. The report is intended to provide the basic background information needed for the consultation with state and local authorities. Urban factors such as geography of the region, present population, industrial pattern of region, probable scale of population, economic growth, and probable directions of physical growth are described. Technical factors such as the emission inventory, air quality analysis, meteorology, modeling results, and air sampling data are presented.

30577 **APTIC NO. 51913**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN MIAMI INTRASTATE AIR QUALITY CONTROL REGION (FLORIDA). *APTD-1189, 58p., March 1970.*

NTIS: PB 215043

This report contains a proposal for the boundaries of the Metropolitan Miami Intrastate Air Quality Control Region as required by the Clean Air Act and outlines the evaluation of technical and urban factors which are the basis of the proposal. The report is intended to serve as the background document for the formal consultation with appropriate state and local authorities. The compilation of an air pollutant emissions inventory makes possible the correlation of pollutant emissions with specific geographic locations. The emissions inventory results are utilized as input data to a meteorological diffusion model to predict the dispersion patterns of the pollutants emitted in the atmosphere. Pollution distribution, manufacturing activity, existing regional arrangements, and existing air pollution control programs are described. Preliminary investigations indicated that the emissions inventory in Broward, Dade, and Palm Beach counties would encompass all of the major air pollutant sources and source areas in southeastern Florida. Topography does not affect air pollution in southeastern Florida. Meteorological factors in the area tend to minimize air pollution. Air pollution in this region is not as serious at the present time as in other large metropolitan areas.

1969

30578 **APTIC NO. 51922**

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN MILWAUKEE INTRASTATE AIR QUALITY CONTROL REGION. *APTD-1188, 49p., June 1969. 9 refs.*

NTIS: PB 215486

A proposal for the boundaries of the Metropolitan Milwaukee Intrastate Air Quality Control Region as required by the Clean Air Act and supporting studies on engineering and urban factors is reported. The report is intended to serve as the background for the formal consultation with appropriate state and local authorities. The study of engineering factors indicates the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. Pollutant sources are located by an inventory of emissions from automobiles, industrial activities, space heating, waste disposal, and other pollution generators. Pollutant concentrations in the ambient air are estimated from air quality sampling data by a theoretical diffusion model. The study of urban factors encompasses all non-engineering considerations. It reviews existing governmental jurisdictions, current air pollution control programs, present concentrations of pollution and industry, and expected patterns of urban growth.

SOCIAL ASPECTS

1972

30579 **APTIC NO. 52287**

Wittes, Janet

EVALUATION OF SENSORY RESPONSE TO DIESEL EXHAUST ODORS: A CRITIQUE. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 26p., 1972. 11 refs. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

Problems encountered in assessing human response to diesel exhaust odor are reviewed. Complaints about diesel exhaust are based not only on its odor, but also on associations with noise, dirt, and large vehicles. All these factors suggest that the public may not be satisfied even if diesel emissions are decreased considerably. Because of the complexities of the relationships among perceived intensity, objectionability, and tendency toward political action, experimental designs could be more useful than sample surveys in determining the effectiveness of odor abatement methods. As an example, an idling truck and a political activist could be planted in a shopping center. The number of people signing a petition urging the truck to cease idling could be determined under conditions of altered control devices, fuels, and noise levels. Experimental injection of diesel exhaust into the air from a remote source might be used to test public response when diesel exhaust is presented as an unidentified odorant. These experiments would be designed to separate the effects of or from factors usually associated with odor, and to divorce measures of objectionability from measures of action. Statistical research on method of linearizing hedonic scales of odor intensity is also needed.

GENERAL

1973

30580 **APTIC NO. 52214**

Montgomery, T. L., J. M. Leavitt, T. L. Crawford, and F. E. Gartrell

CONTROL OF AMBIENT SO2 CONCENTRATIONS BY NONCONTINUOUS EMISSION LIMITATION LARGE COAL-FIRED POWER PLANTS. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Society of Mining Engineers, 29p., 1973. 4 refs. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 102nd, Chicago, Ill., Feb. 25-March 1, 1973.)*

Since 1969 the Tennessee Valley Authority has conducted a noncontinuous sulfur dioxide emission limitation program at its Paradise Steam Plant for controlling ambient SO2 concentrations. The program involves the reduction in generating loads to reduce SO2 emissions during adverse meteorological conditions when ambient control levels would otherwise be exceeded. Load reductions have been implemented on the average about one time per month with an average duration of 3 to 4 hours. The paper discusses TVA s experience with this program, particularly as it demonstrates the practicality of this type of control strategy as a means for achieving compliance with ambient air quality standards. Two other similar TVA programs and additional field study plans involving the use of this technique as an air quality control measure are also described. The plume dispersion model and meteorological criteria for emission limitations are described. (Author abstract modified)

30581 **APTIC NO. 51942**

Olschowy, Gerhard

ENVIRONMENTAL PROTECTION A TASK OF SCIENCE, PLANNING AND PROTECTION. *(Umweltschutz als Aufgabe von Wissenschaft, Planung und Verwaltung). Text in German. Ber. Abwassertech. Ver., vol. 25:17-31, 465-466, 1973. (Presented at the Abwassertechnischen Vereinigung e.V., Main Meeting, Kassel, West Germany, Sept. 8, 1971.)*

The present day pollution of the water and air in the Federal Republic of Germany is discussed. Solid waste disposal problems are mentioned. More than 300 chemical compounds and physical substances are known to be air pollutants. Of the gaseous pollutants, sulfur dioxide assumes the largest portion. Fluorine compounds are rarer in the atmosphere than SO2, but they are far more toxic. While the threshold concentration for SO2 is 0.5 mg/cu m air (0.2 ppm), it is 0.01 mg/cu m air for fluorine. The combination of several pollutants, primarily of waste gases with dusts is particularly dangerous, which is further compounded by temperature inversions. In the Ruhr area the haze caused by air pollution reduces solar radiation by about 30%. This haze absorbs particularly the important ultraviolet radiation. A considerable amount of air pollution stems from traffic. The Federal Republic of Germany presently has 16 million cars which produce 25 billion cu m of waste gas. The numerous combustion processes with fossil fuels such as coal and oil lead to changes of the composition of the atmosphere. Global carbon dioxide emission rose between 1950 and 1963 from 700 billion tons to 1100 billion tons, of which about 50% remain in the atmosphere.

1972

30582 **APTIC NO. 51816**

Mie Prefecture (Japan)

AIR POLLUTION. *(Taiki osen). Text in Japanese. In: Whitepaper on the Environment, p. 11-69, Dec. 1972.*

There were 229 factories that emitted smoke in the Yokkaichi industrial area, and among them, about 50 factories consumed more than 5 kl of heavy oil a day. The average wind velocity in 1971 was 3.1 m/sec. The maximum sulfur dioxide concentration reached to 0.416 ppm at certain locations. Regulations were revised and countermeasures of air pollution were enforced by increasing the numbers of factories and facilities for monitoring. An intermediate goal of the average SO2 concentration (99% value) was set at 0.025 ppm which was to be reached in 1974. The final goal was set at 0.017 ppm and was to be reached as soon as possible.

30583 **APTIC NO. 52462**

POLLUTION OF AIR AND WATER. *(Inquinamento atmosferico e delle acque). Text in Italian. Riv. Combust. (Milan), 26(12):433-455, Dec. 1972.*

In the U. S regulations about maximum permissible sulfur dioxide concentrations refer to concentrations in effluents, to street level concentrations, or to concentrations in the smoke in stacks. Federal norms stipulate a median annual concentration of 0.03 ppm to be reduced gradually to 0.02 and to 0.01 ppm. These norms can be made more stringent by state or city authorities. Pollution control is generally based on street level concentrations which are unpredictable because they are influenced by a number of external factors including topography. A formula for the calculation of the maximum concentration of SO2 for a single emission source is explained. Pollution control must concentrate on protection of the health of personnel working in factories and on industrial waste control including gaseous emissions, liquid effluents, and solid waste. In the case of large industrial enterprises with plants in different localities, pollution control must be decentralized because local conditions differ in each locality. There are reasons for believing that SO2 is beneficial to public health because of its bactericidal action. Respiratory diseases proliferate following a humid and rainy period because the rain has washed away SO2 and thus removed its protective action. The effects of SO2 on health should be studied before billions are spent on SO2 control.

30584 **APTIC NO. 52295**

Holdren, John P.

ENERGY, ENVIRONMENT, AND LIMITS TO GROWTH. *Preprint, American Assoc. for the Advancement of Science, Washington, D. C., 5p., 1972. (Presented at the American Association for the Advancement of Science, Annual Meeting, 139th, Washington, D. C., Dec. 26-31, 1972.)*

Energy-related environmental stresses can disrupt processes such as global nutrient cycles essential to food production and waste disposal, natural regulation of crop pests and disease organisms, and the productivity of the oceans. The disruption can occur by selective poisoning of vulnerable organisms (with oil, radioisotopes, metallic trace contaminants, and photochemical smog); by destruction of habitat (strip mining, highways, and power plant construction on estuaries): by alteration of chemical balances in the environment (sulfur oxides and nitrogen oxides in surface waters and soil); by thermal disruption of aquatic environments (once-through cooling of power plants); and by modification of climate (carbon dioxide, particulate matter, and heat release). Environmental limits to the growth of energy use will not be averted by technology alone. A stabilized level of consumption will be necessary.

30585 **APTIC NO. 52010**

Marier, J. R.

THE ECOLOGICAL ASPECTS OF FLUORIDE. *Fluoride, 5(2):92-97, April 1972. 21 refs. (Presented at the International Society of Fluoride Research, Annual Conference, 4th, Hague, N. L., Oct. 24-27, 1971.)*

The ecological aspects of fluoride are reviewed. Sources of fluorides, fluoride distribution, and final deposition in air, soil, and water are mentioned. Vegetation can be an environment for fluoride, but it can also serve as one of the modes of transport for fluoride uptake by other forms of life. In this way, biological transfer occurs, and food chains are built, increasing the air pollution problem. It is further complicated by recourse to fluoride-containing fertilizers, insecticides, and mineral supplements for livestock. Fluoride burden is also increased from sources such as food and beverage processing, and fluoride containing aerosols and pharmaceuticals.

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